

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
12 April 2007 (12.04.2007)

PCT

(10) International Publication Number
WO 2007/039319 A2

(51) International Patent Classification:
C12Q 1/68 (2006.01)

(21) International Application Number:
PCT/EP2006/010132

(22) International Filing Date:
29 September 2006 (29.09.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
05109025.6 29 September 2005 (29.09.2005) EP

(71) Applicant (*for all designated States except US*): **UNI-VERSITÄT ZU KÖLN** [—/DE]; Albertus-Magnus-Platz, 50923 Köln (DE).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **KRUT, Oleg** [RU/DE]; Schiefersburger Weg 93, 50937 Köln (DE). **PALKA-SANTINI, Marie** [FR/DE]; Mohnweg 2, 50858 Köln (DE). **CLEVEN, Berit** [DE/DE]; Bachstr. 21, 53919 Weilerswist (DE). **KRÖNKE, Martin** [DE/DE]; Eugen-Langen-Str. 2, 50968 Köln (DE).

(74) Agent: **HELBING, Jörg**; P.O. Box 10 22 41, 50462 Köln (DE).

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: ANALYTICAL DEVICE FOR RAPID IDENTIFICATION OF PATHOGENS

(57) Abstract: The present invention provides an analytical device, especially a DNA microarray, for identification and characterisation of microorganisms in a sample or clinical specimen. Furthermore, it provides for a method for rapid identification and strain profiling of different microbial species in a sample or clinical specimen, especially in a blood culture, utilizing said analytical device.



WO 2007/039319 A2

Analytical device for Rapid Identification of Pathogens

The present invention provides an analytical device, especially a DNA microarray, for identification and characterisation of microorganisms in a sample or clinical specimen. Furthermore, it provides for a method for rapid identification and strain profiling of different microbial species in a sample or clinical specimen, especially in a blood culture, utilizing said analytical device.

Background

Isolation, identification and characterisation of bacteria and fungi from such diverse samples like food, environmental samples, clinical specimens, and veterinary samples is still a challenge for today's analytical laboratories. This is due to the fact that generally the identification of microorganisms includes three steps: (a) enrichment of microorganisms by culture, (b) subculture on solid media (preparation of a pure culture), and (c) performing a set of biochemical reactions specific for a particular pathogen. All these steps are dependent on the bacterial growth (slow), they are poorly automated (lot of manual work), and complex (require well educated personal).

Isolation, identification and characterisation of bacteria and fungi from clinical specimens is a main task of microbiological routine diagnostics. In fact, microorganisms are ubiquitous in certain areas of the human body. For this reason isolation and identification of pathogenic bacteria from clinical material and discrimination of specific pathogens from contaminations with indigenous or environmentally encountered microorganisms is a requirement for the correct diagnosis of infectious diseases. Additionally, accurate identification of antibiotic resistance and particular virulence factors provide important information enabling the clinician to choose effective antimicrobial therapy.

In the course of infection, many specimen types can be used for direct identification of the pathogens. These include, but are not limited to, liquor in the course of bacterial meningitis, sputum from patients with bacterial pneumonia, urine in the course of upper and lower urinary tract infections, punktate from sites of deep purulent infections (such as abscess, phlegmone, lung emphysema and septic arthritis), stool from patients with gastrointestinal tract infections, pus, swabs or wound fluid from purulent infections of the skin and wounds. Sometimes, bacteria

are represented in the specimen only in minor numbers, thus, indirect identification of pathogens after culture of specimens in liquid media is employed. Important examples are enrichment cultures of food samples during outbreaks of food borne infections and blood cultures for diagnosis of bloodstream infections.

5 The invasion of the bloodstream by microorganisms, especially bacteremia and fungemia, represents one of the most serious consequences of infections and is a high ranked cause of death (Mylotte, J.M. and Tayara, A., Eur. Clin. Microbiol. Infect. Dis. 19:157-163 (2000); Reimer, L.G. et al., Clin. Microbiol. Rev. 10:444-465 (1997)). Bacteremia is the means by which local infections spread
10 hematogenously to distant organs. This hematogenous dissemination of bacteria is part of the pathophysiology of, e.g., meningitis and endocarditis, Pott's disease and many other forms of osteomyelitis. In the hospital, indwelling catheters are a frequent cause of bacteremia and subsequent nosocomial infections, since they provide a means by which bacteria normally found on the skin can enter the
15 bloodstream. Other causes of bacteremia include dental procedures, urinary tract infections, intravenous drug use, and colorectal cancer.

Systemic fungal infection is becoming more and more common in modern hospitals. The most common fungal infections are candidiasis and aspergillosis, but other systemic fungal infections such as Histoplasmosis, Blastomycosis,
20 Coccidioidomycosis and Cryptococcosis are also of increasing relevance. Systemic fungal infections in hospitals are commonly seen in immune compromised patients and - like bacteremia - in patients with indwelling catheters. Due to underlying serious illnesses and possible resistance of the pathogens to antifungal agents, patients with systemic fungal infections often have poor clinical outcomes.
25 Infections due to *Candida* species are the fourth most important cause of nosocomial bloodstream infection.

Bacteremia is operationally defined as the presence of viable bacteria as evidenced by positive blood cultures. Fungemia is similarly defined as the presence of viable fungi as evidenced by positive blood cultures. When bacteremia or fungemia occurs
30 in the presence of systemic symptoms (such as fever or chills) the condition is designated as sepsis; and in the setting of more severe disturbances of

temperature, respiration, heart rate or white blood cell count, is characterised as systemic inflammatory response syndrome (SIRS).

Many septic episodes are nosocomial and often due to microorganisms with increased and multiple antimicrobial resistance. *Staphylococcus aureus*, *Escherichia coli*, Coagulase-negative staphylococci (CoNS), *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Enterococcus* spp., *Streptococcus* spp., *Candida albicans* and *Enterobacter cloacae* are the most frequent etiological agents of bacteremia and fungemia in Europe (Decousser, J. W. et al., J. Antimicrob. Chemother. 51:1214-22 (2003); Lyytikainen, O. et al., Clin. Infect. Dis. 35:314-9 (2002); Reacher, M.H. et al., BMJ 320:213-6 (2000); Rosenthal Kreuberger, E.J., Int. J. Antimicrob. Agents 24:196-8 (2004)) and the USA (Bourbeau, P.P. and Pohlman, J.K., J. Clin. Microbiol. 39:2079-82 (2001); Reimer, L.G. et al., Clin. Microbiol. Rev. 10:444-65 (1997); Reisner, L.G. et al., J. Clin. Microbiol. 37:2024-6 (1999); Wilson, M.L. et al., J. Clin. Microbiol. 37:1709-13 (1999)).

Nosocomial bacteremia and especially sepsis require an immediate antibiotic therapy, even when the causative bacteria are still unknown. Thus, said therapy has to be performed as empirical initial therapy (Rello, J. et al., Intensive Care Med. 20:94-98 (1994)), which covers the complete spectrum of relevant pathogens. However, the increase of bacterial resistance lowers the chance of success for such empirical antibiotic treatments considerably (Mylotte, J.M. and Tayara, A., Eur. Clin. Microbiol. Infect. Dis. 19:157-163 (2000); Weinstein, M.P. et al., Clin. Infect. Dis. 24:584-602 (1997)). This primary therapy can only be replaced by a specific treatment after a thorough microbial diagnosis which usually takes 76-120 h (Bourbeau, P.P. and Pohlman, J.K., J. Clin. Microbiol. 39:2079-2082 (2001)). A fast track diagnosis which shortens this lag time would increase the chance of therapy success.

Rapid and reliable detection of bloodstream infections, including characterisation of the pathogen to the species level and determination of its antibiotic susceptibility pattern, is crucial for several reasons: (i) Appropriate antimicrobial agents can be selected, and thus, unnecessary treatment with ineffective antibiotics can be avoided; (ii) the prognosis of the patients can be improved; (iii) the acquisition of resistances in pathogens may be decelerated and (iv) expenditures on antimicrobials and overall hospital costs can be reduced (Barenfanger, J. et al., J.

Clin. Microbiol. 37:1415-8 (1999); Doern, G.V. et al., J. Clin. Microbiol. 32:1757-62 (1994); Trenholme, G.M. et al., J. Clin. Microbiol. 27:1342-5 (1989); Wheeler, A.P. and Bernard, G.R., N. Engl. J. Med. 340:207-14 (1999)). Therefore, there is a strong need for rapid tests for specific and sensitive identification of bacteria and pathogenic fungi directly from blood cultures.

The diagnosis of bacteremia commonly relies on blood cultures where the growth of microorganisms is continuously monitored by automated devices (James, P.A. and Al-Shafi, K.M., J. Clin. Pathol. 53:231-233 (2000); Reisner, B.S. and Woods, G.L., J. Clin. Microbiol. 37:2024-2026 (1999); Wilson, M.L. et al., J. Clin. Microbiol. 37:1709-1713 (1999)). Although such continuous-reading and computed systems decrease the time for detection of positive blood cultures, definitive pathogen identification from positive blood cultures still requires traditional Gram-staining, sub-culturing and susceptibility testing, delaying the identification of pathogens for one to three days (Levi, K. and Towner, K.J., J. Clin. Microbiol. 41:3890-3892 (2003); Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003); Oliveira, K. et al., J. Clin. Microbiol. 40:247-251 (2002); Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)). The subculture procedure with subsequent species identification and determination of antibiotic resistance is time-consuming and elaborate. The biochemical and immunological assays like testing with coagulase, nuclease or latex agglutination are not always reliable. Antigenic and biochemical variations of bacteria grown in blood culture, inhibitory action of blood culture medium components as well as the presence of more than one microbial species may mislead data interpretation.

Staphylococci are the most important and frequent group of pathogens growing in blood culture, responsible for 30% to more than 50% of all bacteremia events (James, P.A. and Al-Shafi, K.M., J. Clin. Pathol. 53:231-233 (2000); Reisner, B.S. and Woods, G.L., J. Clin. Microbiol. 37:2024-2026 (1999); Velasco, E. et al., Sao Paulo Med. J. 118:131-138 (2000)) with a mortality rate ranging from 13 to 50% (McClelland, R.S. et al., Arch. Intern. Med. 159:1244-1247 (1999); Rello, J. et al., Intensive Care Med. 20:94-98 (1994); Weinstein, M.P. et al., Clin. Infect. Dis. 24:584-602 (1997)). The emergence of *S. aureus* strains with multiple resistance to antibiotics makes empirical therapy prone to fail (Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)). *S. aureus* is generally regarded as a virulent

pathogen, whereas CoNS are either considered as a cause of catheter-associated nosocomial bacteremia or, more frequently, as blood culture contamination. Thus, a sub-genus identification of gram-positive cocci in clusters (CPCC) is of great clinical significance (Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003)).

- 5 Methods used up to date for direct identification of *S. aureus* growing in blood culture bottles include biochemical tests, like detection of thermostable nuclease or tube coagulase test, or commercial antibody-based kits connected with the disadvantages listed above.

Besides *S. aureus* and coagulase-negative staphylococci, *E. coli*, *Klebsiella* spp.,
10 *Enterobacter* spp., *Proteus* spp., *Pseudomonas aeruginosa*, *Streptococcus pneumoniae*, beta hemolytic Streptococci and *Enterococcus* spp. belong to the most frequent reported pathogens causing bacteremia (Reimer, L.G. et al., Clin. Microbiol. Rev., 10:444-65 (1997); Reacher, M.H. et al., BMJ, 320:213-6 (2000); Lyytikainen, O. et al., Clin. Infect. Dis., 35:e14-9 (2002)) In order to reduce the
15 time needed for identification and susceptibility testing, the possibility of combining an automated blood culture system with an automated identification and susceptibility testing system by direct inoculation from positive blood cultures has been studied for gram-positive cocci as well as for gram-negative rods by several groups of investigators, but with varying success (Reimer, L.G. et al., Clin.
20 Microbiol. Rev., 10:444-65 (1997); Hansen, D.S. et al., Clin. Microbiol. Infect., 8:38-44 (2002); Ling, T.K. et al., J. Clin. Microbiol., 41:4705-7 (2003); Funke, G. and Funke-Kissling, P., J. Clin. Microbiol., 42:1466-70 (2004)). Although the authors saw some potential of the combined system to allow the agar isolation step to be skipped, the system is hampered by the fact that (i) the blood culture sample
25 has to undergo a time-consuming separation procedure for the enrichment of bacterial cells, (ii) the identification rate varies depending on the employed identification system and (iii) the performance is not equally good for gram-negative and gram-positive pathogens (Reimer, L.G. et al., Clin. Microbiol. Rev., 10:444-65 (1997); Ling, T.K. et al., J. Clin. Microbiol., 41:4705-7 (2003); Funke, G. and
30 Funke-Kissling, P., J. Clin. Microbiol., 42:1466-70 (2004)).

Considerable progress was made using nucleic acid-based methods for the identification and genotyping of bacteria or fungi in blood specimens. Assays employing ribosomal RNA-based oligonucleotide probes like fluorescence *in situ*

hybridisation (FISH) (Chapin, K. and Musgnug, M., J. Clin. Microbiol. 41:4324-7 (2003); Jansen, G.J. et al., J. Clin. Microbiol. 38:814-7 (2000); Kempf, V.A. et al., J. Clin. Microbiol. 38:830-8 (2000); Oliveira, K. et al., J. Clin. Microbiol. 41:889-91 (2003)) or microarrays (Anthony, R.M. et al., J. Clin. Microbiol. 38:781-8 (2000);
5 Marlowe, E.M. et al., J. Clin. Microbiol. 41:5127-33 (2003); Sogaard, M. et al., J. Clin. Microbiol., 43:1947-9 (2005)) provide for rapid species identification in blood cultures. However, methods solely based on ribosomal RNA probes allow species identification only, and do not provide information on antibiotic susceptibility and other strain specific characteristics (e.g. virulence genes). For the molecular
10 detection of antibiotic resistances in staphylococci, several multiplex PCR-based assays were described (Martineau, F. et al., Antimicrob. Agents Chemother. 44:231-8 (2000); Shrestha, N.K. et al., Approved standard M2-4A, Villanova, PA (1990); Strommenger, B.C. et al. J. Clin. Microbiol. 41:4089-94; Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-31 (2001)). Several groups have successfully identified *S.*
15 *aureus* and more specifically methicillin-resistant *S. aureus* strains (MRSA) from blood cultures by using DNA probes (Levi, K. and Towner, K.J., J. Clin. Microbiol. 41:3890-3892 (2003); Poulsen, A.B. et al., J. Antimicrob. Chemother. 51 :419-421 (2003)), peptide nucleic acid probes (Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003)), multiplex PCR (Mason, W. J. et al., J. Clin. Microbiol. 39:3332-3338
20 (2001)), gel-based PCR (Krishnan, P.U. et al., J. Clin Pathol. 55:745-748 (2002)), and real-time PCR (Shrestha N.K. et al., J. Clin. Microbiol. 40:2659-2661 (2002); Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)).

However, the use of such molecular assays suffers from two main restrictions: First, they rely on a pre-identification of the pathogen since their discriminatory
25 capacity is technically limited, for instance by the number of fluorochromes available for labelling the probes or, in the case of multiplex PCR, by the capacity of resolution in gel electrophoresis. These molecular assays are thus usually not scalable and unfit for high throughput analysis.

The last years have witnessed the emergence of many DNA microchip projects
30 arraying genes of microorganisms (Ye, R.W. et al., J. Microbiol. Methods 47:257-272 (2001)). They can detect tens of thousands of DNA sequences in a single hybridisation step (DeRisi, J.L. et al., Science 278:680-686 (1997); Duggan, D.J. et al., Nat. Genet. 21:10-14 (1999); Lashkari, D.A. et al., Proc. Natl. Acad. Sci. USA

94:13057-13062 (1997)). Originally developed for gene expression profiling, DNA sequence analysis and genotyping, microarrays were recently also used to identify viral (Wang, R.F. et al., FEMS Microbiol. Lett. 213:175-182 (2002)) and bacterial (Bekal, S. et al., J. Clin. Microbiol. 41:2113-2125 (2003)) pathogens in
5 environmental and clinical samples.

Most of the published reports employed oligonucleotide microarrays containing a reduced number of spotted probes and representing a single bacterial species only (Volokhov, D. et al., J. Appl. Microbiol. 95:787-798 (2003); Volokhov, D. et al., J. Clin. Microbiol. 41:4071-4080 (2003); Volokhov, D. et al., J. Clin. Microbiol.
10 40:4720-4728 (2002)). Such arrays were used to identify pathogenic strains belonging to a pre-identified species (Chizhikov, V. et al., Appl. Environ. Microbiol. 67:3258-3263 (2001)), to distinguish between species of the same genus (Volokhov, D. et al., J. Clin. Microbiol. 41:4071-4080 (2003); Volokhov, D. et al., J. Clin. Microbiol. 40:4720-4728 (2002)) or to detect genes encoding resistance to a
15 certain antibiotic (Volokhov, D. et al., J. Appl. Microbiol. 95:787-798 (2003)).

Further microarrays for detection of bacteria and fungi are known in the art (Nakamura, M. et al., Abstracts of the general meeting of the American society for microbiology, abstract No C219 (2003); Wang, R.-F. et al., Molecular and Cellular Probes 223-224 (2004); Lehner, A. et al., FEMS Microbiol. Lett. 133-142 (2005); EP
20 1310569; WO 92/07096; US-B1-6,747,137). However, all these microarrays have in common the use of short oligonucleotides with a maximum length of 40 nt ("short oligonucleotides"). They are short-oligonucleotide microarrays. Although such short-oligonucleotide microarrays could be rapidly designed and built up they carry some intrinsic disadvantages: like all methods based on single and often short
25 DNA sequences they show reduced reliability and sensitivity (Stears, R.L. et al., Nat. Med. 9:140-145 (2003)). To palliate the high probability of non-specific hybridisation due to the short size (20-40 bp) of the oligonucleotides it is necessary to design many partially overlapping oligonucleotides in order to confirm the presence of a gene. This consequent increase in complexity makes it extremely
30 difficult to set up the optimal hybridisation conditions necessary for producing trustful results. Moreover, surface-bound short oligonucleotides have poor hybridisation properties and are highly sensitive to single nucleotide polymorphisms (Hughes, T.R. et al., Nat. Biotechnol. 19:342-347 (2001)). For these reasons,

oligonucleotide microarrays using oligonucleotides with a maximum length of 40 nt are unsuitable for routine diagnostics.

Up to now, diagnosis of bacteremia by microarrays is limited to species identification by oligonucleotides for 23S and 18S RNA sequences, which is still strictly experimental (Anthony, R.M. et al., J. Clin. Microbiol. 38:781-788 (2000)) and carries along the methodological weakness associated to the use of short oligonucleotides as hybridisation probes.

A DNA microarray employing capture probes of more than 40 nt length amplified by PCR was described by Fitzgerald et al. (Fitzgerald, J.R. et al., Proc. Natl. Acad. Sci. USA 98(15):8821-8826 (2001)). To investigate molecular population genetics of *Staphylococcus aureus* on a genome scale, a microarray comprising 2817 complete ORFs of *S. aureus* strain COL was constructed, representing >90% of the *S. aureus* genome. The microarray was able to discriminate 36 *S. aureus* strains. However, since it was not designed for the identification of different bacterial species, it was not tested for possible cross reactions with other bacteria besides *S. aureus*. Due to the conservative nature of many house-keeping proteins and genes, respectively, cross reactions of the microarray with CoNS strains and other bacterial species will occur. Unspecific cross reactions combined with the high number of probes (2817) result in a high complexity of the microarray data, not applicable to routine diagnostics. Furthermore, PCR amplification of long ORFs is a difficult procedure, in particular for bacteria with DNA of high GC-content.

The aim of present invention is to provide a gene-segment based analytical device, especially a microarray, for species specific identification and characterisation of different microorganisms, especially different bacteria and pathogenic fungi, present in a sample or clinical specimen which does not possess the drawbacks of the short-oligonucleotide microarray as outlined above. Said device/microarray must allow the specific identification of the target species and should furthermore allow the differentiation (i.e. distinguish) between different target microorganisms present in the sample or clinical specimen. It must furthermore provide a high reliability and sensitivity of detection.

Summary of the Invention

The present invention provides an analytical device, which is preferably a DNA microarray, for the identification and characterisation of microorganisms in

biological samples, especially of microorganisms connected with bacteremia, fungemia and sepsis. Species specific gene probes in this device/microarray allow the identification of different microbial species, whilst antibiotic resistance and virulence gene probes allow for the genotypic discrimination within a species. The
5 device/microarray can be designed to allow species identification, virulence determination and resistance determination independently from each other or simultaneously, and furthermore said determinations can be performed for one or more different microbial species and strains with one device/microarray. Furthermore, different microbial species and strains are discriminated, even in a
10 polymicrobial sample (specimen with more than one pathogen).

The device/DNA microarray according to present invention thus demonstrates the feasibility of simultaneously identifying and characterising different microbial species in a sample or clinical specimen, especially in blood samples, without prior PCR amplification of target DNA or pre-identification of the pathogen. This can
15 reduce sample processing time to a single day and less.

The invention furthermore provides a method for rapid identification and characterisation of microorganisms, especially of bacteria, yeasts and filamentous fungi, using the device/microarray of the invention. The method is quick, can be automated, leads to reproducible results and allows an early choice of specific
20 antibiotics for treatment of bacteremia, fungemia or sepsis.

In particular, the present invention provides

- (1) an analytical device for direct identification and characterisation of microorganisms in a sample or clinical specimen, wherein the analytical device comprises species specific gene probes which are (i) selected from DNA sequences or partial DNA sequences of the microorganisms to be identified or DNA sequences
25 complementary or homologous thereto, and (ii) have a length of at least 100 nucleotides (nt);
- (2) the use of the analytical device as defined in (1) above for *in vitro* identification and characterisation of microorganisms in a sample or in a clinical specimen, preferably in a clinical specimen, more preferably for the diagnosis of a clinical
30 condition, most preferably for the diagnosis of bacteremia, fungemia or sepsis;
- (3) an *in vitro* method for identification and characterisation of microorganisms in a sample or in a clinical specimen comprising

- (a) isolating the total DNA from the sample or clinical specimen and labelling the DNA with a reporter molecule, preferably a fluorochrome;
- (b) applying the DNA thus obtained to the analytical device as defined in (1) above and hybridising the DNA with the gene probes of the device; and
- 5 (c) detecting DNA bound to the device by determination of the amount of the reporter molecules bound to the device; and
- (4) a kit for detection of microorganisms in a sample or clinical specimen comprising the analytical device of embodiment (1).

Brief description of the Figures

10 Fig. 1: DNA microarray analyses of 58 clinical isolates, reference strains and blood cultures.

Each column shows the results of an individual hybridisation with target DNA prepared from: *S. aureus* ATCC 29213 (1), MW2 (2), clinical isolates (3-7), positive blood cultures (8-11); *P. aeruginosa* ATCC 27853 (12), clinical isolates (13-17),
 15 positive blood culture (18); *E. coli* ATCC 25922 (19), clinical isolates (20-25), positive blood cultures (26-27); *S. epidermidis* clinical isolates (28-32), positive blood cultures (33-35); clinical isolates of *S. auricularis* (36), *S. capitis* (37), *S. haemolyticus* (38), *S. hominis* (39), and *S. warneri* (40). Other Gram-negative species included a *Proteus mirabilis* positive blood culture (41), clinical isolates of
 20 *Proteus mirabilis* (42-43), *Serratia marcescens* (44-45), *Klebsiella pneumoniae* (46-48), *Stenotrophomonas maltophilia* (49), *Acinetobacter baumannii* (50), *Enterobacter cloacae* (51) and *Enterobacter aerogenes* (52); other Gram-positive species included clinical isolates of *Micrococcus* spp. (53), *Enterococcus* spp. (54), *Enterococcus faecalis* (55) and *Streptococcus pneumoniae* (56) and two positive
 25 blood cultures of *S. pneumoniae* (57-58).

(A) Hybridisation of DNA prepared from bacterial isolates, reference strains and blood cultures with *E. coli* gene probes;

(B) hybridisation with *P. aeruginosa* gene probes;

(C) hybridisation with *S. aureus* gene probes.

30 Grey boxes represent gene probes which hybridised with the respective target DNA, white boxes represent gene probes which showed no hybridisation with the respective target DNA.

Fig. 2: Validation of the *S. aureus* microarray of example 1.11. 2 µg genomic DNA from *S. aureus* strain T94 were labelled either with Cy3 or Cy5, combined and hybridised as described in Example 1.11. Cy3: green signal; Cy5: red signal; double-hybridisation: yellow signal.

- 5 A) Overlay of microarray scanned using Cy3 and Cy5 filter sets;
B) Scatterplot of normalized fluorescence intensities of individual gene probes after microarray hybridisation. The signal intensities from both channels correlate highly with each other ($r^2 = 0.97$).

10 Fig. 3: Specific identification of *S. aureus* from distantly related bacteria using the microarray of example 1.11. 2 µg of *S. aureus* DNA were co-hybridised with 2 µg of pure *E. coli* (A) or *P. aeruginosa* (B) genomic DNA. Obtained hybridisation patterns are represented as bar codes, where the 140 spotted gene segments appear subsequently and are clustered in categories (NC: negative control; PC: positive control; Antibiotic Resistance Determinants; Virulence Factors and Metabolic
15 Functions (see Tab. 6)). Positive hybridisation is indicated by a bar while negative spots are represented by an empty area. Both assays show clear *S. aureus* discrimination with practically no cross hybridisation between DNA from said gram negative bacteria and *S. aureus* selected genes, while the positive control (16S RNA sequence) reveals the good quality of hybridisation.

20 Fig. 4: Specific identification of *S. aureus* from coagulase negative staphylococci using the microarray of example 1.11. 2 µg of *S. aureus* DNA were co-hybridised with 2 µg of *S. epidermidis* (A) or *S. saprophyticus* (B) genomic DNA. Obtained hybridisation patterns are illustrated by scanned fluorescent picture data (A: *S. aureus*: green signal; *S. epidermidis*: red signal; B: *S. aureus*: red signal; *S. saprophyticus*: green signal) and transformed in bar codes (see legend of Fig. 3).
25 All specific *S. aureus* virulence factor genes hybridised exclusively with *S. aureus* DNA. Yellow spots showing cross-hybridisation correspond to some shared antibiotic resistance determinants and genes associated to metabolic functions.

Fig. 5: Specificity of the *S. aureus* microarray of example 1.11.

- 30 A) Scan of microarray hybridised with 2 µg each of genomic DNA from *S. aureus* strain T103 (Cy3, represented in green) or T100 (Cy5, represented in red), showing remarkable genotypic differences between strains.

B) PCR amplification of the genes from genomic DNA of *S. aureus* (strains T100 and T103) validating results of the microarray hybridisation shown in (A).

Fig. 6: Identification and characterisation of *S. aureus* from positive blood culture using the microarray of example 1.11.

5 2 µg of DNA prepared from blood culture positive for *S. aureus* (strain T95) was co-hybridised with 2 µg of DNA prepared from sterile blood culture or with 2 µg of pure *S. aureus* genomic DNA for 4 hours. Positive and negative spots are transformed in a bar code scheme (see legend of Fig. 3).

Sterile blood culture DNA did not cross-hybridise with spotted *S. aureus* genes (A).

10 Blood culture positive for *S. aureus* produced a fluorescent hybridisation pattern almost identical to the pattern obtained with pure *S. aureus* genomic DNA (B).

Fig. 7: Hybridization profiles obtained in Example 2 after microarray hybridization with DNA obtained from six bacterial target strains: (A) *S. aureus* ATCC 29213, (B) *S. epidermidis* BC 1920, (C) *S. pyogenes* DSM 11723, (D) *S. pneumoniae* ATCC
15 49619, (E) *E. faecalis* UW 700700/95, (F) *E. faecium* VRE9182 and two non-target strains: (G) *E. casseliflavus* UW703/95 and (H) *S. angiosus* DSM 20563.. Each bar represents the fluorescent signal of one capture probe. Fluorescent signals of the 930 probes represent the median intensity of four spots from which the local background was subtracted. Probe IDs are given in Table 8.

20 Fig. 8: Specificity of the microarray for *Candida albicans* in Example 2. (A) Hybridization profile obtained for *C. albicans* ATCC 10231. (B) Specificity of two *C. albicans* capture probes. Hybridization signals were determined for the two probes after hybridization with DNA obtained from 44 different microbial strains (see Table 9 for strain identification).

25 Fig. 9: Specificity of selected capture probes for (A) *Klebsiella oxytoca*, (B) *K. pneumoniae*, (C) *Proteus vulgaris* and (D) *P. mirabilis* does allow species discrimination. Fluorescence intensities refer to hybridization signals obtained for the respective probes after hybridization with DNA isolated from 44 different microbial strains (see Table 9 for strain identification).

30 Fig. 10: Specificity of selected capture probes for the coagulase-negative staphylococci (A) *S. epidermidis*, (B) *S. haemolyticus*, (C) *S. warneri* and (D) *S. saprophyticus*. Fluorescence intensities refer to hybridization signals obtained for

the respective probes after hybridization with DNA isolated from 44 different microbial strains (see Table 9 for strain identification).

Definitions

5 In the framework of the present invention the following terms and definitions are used.

An "analytical device" in the context of present invention is any solid support onto which DNA gene probes are attached in a way permitting hybridisation of the DNA in the sample and subsequent detection of the bound DNA. This includes microtiter
10 plates coated with one or several DNA gene probes per well, glass surfaces (like, e.g., microscopic slides) with DNA spots, filter paper disks, membranes, gold electrodes and beads (particles with a diameter of from 1 nm to several μm made of glass, plastic, metal etc.) coated with DNA, etc.. The beads may be used in a multi-chamber system, preferably in a microfluidic multi-chamber system, wherein
15 each chamber contains a population of beads. Each bead has an attached DNA sequence and the whole beads population in one chamber will carry the same DNA sequence, each chamber corresponding then to a specific capture probe. The target DNA to be analysed flows through the multi-chamber system and will hybridize with the complementary DNA sequences attached to the beads. Beads could be also
20 attached to a surface by magnetic force, i.e. paramagnetic beads coupled with DNA could be attached on the surface of the magnet and arrange in a lattice structure. Vice versa, beads made of a magnetic material could be attached to an iron surface.

The analytical device of present application is preferably a DNA microarray, a
25 (magnetic) bead or set of beads coated with DNA probes or a microtiter plate coated with DNA probes. More preferred it is a (magnetic) bead or set of beads coated with DNA probes or a DNA microarray. In the most preferred aspect of present invention it is a DNA microarray.

A "DNA microarray" consists of a collection of nucleic acid sequences, preferably
30 DNA sequences, immobilized onto a solid support, such as glass, plastic or silicon chips, in a latticed pattern (forming an "array"). Each unique sequence of said sequences forms a tiny feature on the microarray called a "spot" or "capture probe". The size of these spots varies from one system to another, but is usually

less than two hundred micrometers in diameter, thus up to tens of thousands of spots can be arrayed in a total area of a few square centimeters. DNA microarrays provide a means to detect and quantify large numbers of discrete nucleic sequences in parallel. In a microarray hybridisation the nucleic acids in the sample that is being analysed (called "target") are expected to form duplexes specifically with the corresponding capture probes. Occurrence or absence of duplex formation indicate the presence or absence of said target. For routine microarray analysis, said target is commonly converted to a labelled population of nucleic acids, using reporter molecules. Hybridisation of said labelled target DNA molecules from the tested samples with complementary DNA sequences affixed in specific spots on the array can thus be detected by examination for the presence of said label on the array using a microarray scanner (Müller, H.-J., Röder, T., "Der Experimentator: Microarrays", Spektrum Akademischer Verlag, Heidelberg (2004)).

In the following, the invention is exemplified for a DNA microarray (synonym: "array"). The invention can, however, also be performed using any other of the analytical devices as listed above.

"Gene probe" or "gene probe derived from..." refers to a DNA sequence present on the microarray of present invention and used as a capture probe. It is a DNA segment (see below) which is complementary to a target DNA sequence, preferably to a microbial, more preferably to a bacterial or fungal gene or gene segment. Said gene probe is prepared by any known method of DNA synthesis, and preferably prepared by cloning the respective PCR-amplified gene or gene segment into a plasmid/vector. The recombinant gene or gene segment is then amplified by PCR, isolated from the amplification mix, purified (preferably by ethanol-purification) and finally spotted onto the array.

An "isolate" is a microbial, especially a fungal or bacterial strain isolated from a given specimen, wherein the isolation includes at least one *in vitro* propagation.

A "clinical isolate" is an isolate from a clinical specimen.

"Coagulase-negative staphylococci" ("CoNS") are bacteria of the genus *Staphylococcus* which are negative for a bacterial coagulase (do not induce clotting of a serum). These are all *Staphylococci* with the exception of *S. aureus*. Preferred CoNS in the context of present invention are *Staphylococcus epidermidis*,

Staphylococcus haemolyticus, *Staphylococcus lugdunensis* and *Staphylococcus warneri*, of which *Staphylococcus epidermidis* is especially preferred.

An "isolated DNA" is a DNA separated or purified from the organism it is naturally associated with or from the clinical specimen in which it occurs. This comprises
5 biochemically or biophysically purified native DNA, recombinant DNA, chemically synthesized DNA and DNA analogues (e.g. peptide nucleic acids).

"Native" is synonymous to "naturally (occurring)".

A "DNA segment" or "gene segment" is an isolated DNA which contains or consists
10 of a part of the native full-length sequence of a gene which is still able to hybridize to the native sequence under stringent hybridisation conditions. Although the present invention is in the following exclusively described as relating to "DNA" sequences, it is not to be construed as being limited thereto. Rather, if the term "DNA" is used in connection with the gene probes or target sequences of present invention, it includes other polynucleotides (like RNA or RNA/DNA hybrids), and
15 DNA analogues such as PNA, phosphonate backbone DNA, artificial pentose or hexose backbone DNA which is able to hybridize with native DNA etc.. Furthermore, modified bases like deoxy bases, inosine or aminoallylcytosine may be used on all DNA, RNA and PNA backbones. However, DNA itself is the preferred polynucleotide for performance of the invention.

20 The DNA sequences used as gene probes in present invention are either identical, substantially identical or homologous to the complementary native target sequences (i.e. they are "derived from" said target sequences). In the context of present invention, when a specific DNA sequence is denominated, this encompasses not only said specific sequence, but also the sequences substantially identical or
25 homologous thereto, i.e. its substitution mutants. "Substantially identical" means that the DNA contains mutations of up to 10% of the total number of nt in comparison with the native DNA sequence and/or has a nucleotide identity of > 90% to the corresponding native DNA segment. Said mutations are preferably single nucleotide polymorphisms or point mutations and include the mutation of not
30 only a single but also a few (up to 10 nt, preferably up to 5 nt) consecutive nt. "Homologous" or "homologue" refers to a DNA sequence which has a sequence identity of more than 70% of the corresponding native DNA sequence and encompasses the substantially identical DNA sequences. Preferably, the sequences

used as gene probes are at least substantially identical to the corresponding native DNA sequence.

Preferred gene probes of the present invention are the DNA sequences listed in the sequence protocol, their complementary sequences or their corresponding native
5 DNA segment.

The DNA sequences used as gene probes in present invention may also be deletion or addition mutants of the corresponding native DNA segments. In case of deletion mutants, the minimum length of the DNA sequences suitable as probes in present invention is 100 nt. Preferably, the deletions take place at the 5'- and/or 3'-
10 terminus of the native DNA segment. In case of addition mutants, the added nucleotides may sum up to a total of 90% of the nucleotide number of the native DNA segment, if added at the 5'- or 3'-terminus of the DNA sequence. Alternatively, the additions and deletions may be of one isolated nucleotide or of 2 or more consecutive nucleotides at one or more internal site(s) of the native DNA
15 segment. Preferably, 0-30% nucleotides of the corresponding native DNA segment are added or deleted. It is most preferred that the addition or deletion mutants used as gene probes in present invention comprise one or more segment(s) of at least 100 consecutive nt each, which are derived from one gene, and/or sequences homologous (70% homology) or complementary thereto. These segments may be
20 embedded in or fused to other DNA sequences, which will not hybridize under stringent conditions with either human or bacterial DNA or the DNA of the target microorganism. Said other DNA sequences preferably have a maximum length which adds up with the length of the enclosed segment(s) to not more than the upper limit for the length of gene probes suitable for present invention.

25 A "positive blood culture" is an *in vitro* culture started from whole blood or blood components wherein the growth of microorganisms has been detected. Said growth is indicated by a positive growth index. The detection is preferably done by monitoring CO₂ production in the blood culture.

"Direct identification" of microorganisms refers to an identification method which
30 comprises isolation of DNA from a sample or clinical specimen, but does not require an amplification of the genetic material of the microorganisms after said isolation in order to identify the microorganisms using the method of present invention. The isolated genetic material is labelled and applied to the DNA microarray of present

invention without prior amplification, i.e. directly after isolation or after a short workup step.

„Species-specific“ probe(s) means that a species can be identified specifically and unambiguously using said probe or set of probes.

- 5 “Differentiation” means the discrimination among distinct and different species, genera or groups of pathogens.

A “detection method” in the context of the present invention is a method for determination of hybridisation of DNA molecules contained in a sample to the probes on the solid support of the microarray of present invention. This method
10 may be any textbook method for detection of DNA hybridisation on microarrays, e.g. direct detection or labelling of target DNA with a reporter molecule and consecutive visualisation of the reporter molecule. Preferred detection methods are said labelling method and the direct detection by electrical biosensors or mass spectrometry (Liu, R. H. et al., Anal. Chem. 76(7):1824-31 (2004); Stomakhin, A.
15 A. et al., Nucleic Acids Res. 28(5):1193-8 (2000)).

A “reporter molecule” in the context of the method of the present invention is a chemical or physical marker which allows differentiation of labelled from unlabelled DNA by physical, chemical or immunological methods. The labelling method includes, but is not limited to radioactive labelling (e.g. with ^{33}P , ^{32}P),
20 fluorescent/luminescent/chromophor labelling and hapten labelling (i.e. psoralen or DIG). It is followed by an appropriate detection step necessary to determine the presence and/or quantity of the reporter molecule, namely scintillation counting (e.g. phosphoimaging); photoptic measurement (e.g. fluorescence measurement, luminescence measurement) and antibody-based detection (including colorimetric,
25 luminescence or fluorescence detection), respectively. Preferably, the reporter molecule is a fluorochrome/fluorophor (both terms are used as synonyms in the context of present invention) which includes but is not limited to cyanines, fluoresceins and rhodamines. More preferably, it is of the cyanine group of fluorophores. Most preferably, it is selected from the group consisting of the
30 fluorophores Cy3, Cy5 or Alexa Fluor 647 and Alexa Fluor 546. The ratio of base to dye molecules (BDR) in DNA labelled with such reporter molecules is preferably less or equal to 60.

A "target species" is a species for which species-specific capture probes are present in the microarray, allowing species identification by positive hybridisation. "Non-target species" are all other species.

Detailed description of the invention

5 The present invention provides an analytical device, preferably a DNA microarray, and its use for rapid identification and characterisation of microorganisms in a sample or clinical specimen (embodiments (1) to (3)). The invention is exemplified in the following by the most preferred embodiment of the analytical device (1), namely a DNA microarray. The invention can, however, also be performed using
10 any other of the analytical devices as listed above. Thus, unless otherwise stated, in the following the term "DNA microarray of embodiment (1)" is to be understood as "analytical device of embodiment (1)".

The DNA microarray of embodiment (1) of the invention comprises gene specific DNA sequences as capture probes, which allow the identification of microbial
15 species ("target species"), especially of bacterial and fungal species, and/or their further characterisation with regard to antibiotic resistance and virulence. Preferably, it allows the identification and characterisation of the target species. It is specific, applicable to the analysis of DNA isolated from blood cultures and suitable to detect resistance genes.

20 The DNA microarray of embodiment (1) comprises at least 1 species specific probe per target species. In a preferred aspect of the invention, it additionally comprises one or more virulence and/or resistance gene probe(s).

A further preferred aspect of embodiment (1) is that the DNA microarray comprises species specific probes for more than one or multiple microbial species,
25 i.e. for a plurality of species. The DNA microarray of this preferred aspect of embodiment (1) allows the simultaneous detection of a plurality of microbial species in a sample without previous isolation and/or amplification of single species. It furthermore allows a one-step determination of whether certain microorganisms are present in a sample or not, even if the sample comprises a plurality of different
30 microbial strains.

One important feature of the microarray of the present invention is that the panel of probes can be continually extended to include sequences for additional species,

variant isolates or antibiotic resistance determinants as they are characterised and available. The accuracy, range and discriminatory power of the gene-segment based microarray can be refined by adding or removing gene probes to the panel without significantly increasing complexity or costs. In a pilot study, three
5 important species causing bacteremia were selected to provide a proof of principle (examples 1.1-1.10). The range of organisms that can be identified can be easily expanded by increasing the number of gene probes on the array. For example, addition of a few probes specific for *S. epidermidis* and other CoNS will allow for the species identification of coagulase-negative staphylococci. Furthermore, due to a
10 specific hybridisation pattern for each species it will also allow the identification of mixed blood cultures with more than one pathogen.

A second important feature of this microarray format is the length of the DNA sequences used as gene probes. They are at least 100 nt, preferably 100-3000 nt long. In an especially preferred aspect of embodiment (1) the length of the gene
15 probes is from 100 to 1000 nt, most preferably from 200 to 800 nt. Thus, one probe per gene is usually sufficient to produce strong signals and high specificity (Stears, R.L. et al., Nat. Med., 9:140-5 (2003)). For long probes like these, minor point mutations are likely to only slightly reduce duplex formation, which does not lead to the loss of hybridisation signals. In contrast, short oligonucleotide
20 microarrays sometimes lack specificity and require multiple short oligonucleotides per one gene.

The microorganisms or microbial DNA to be detected using the microarray of present invention are preferably bacteria (such as *Staphylococci*, *Enterococci*, *Streptococci*, *E. coli*, *P. aeruginosa*, *Klebsiella* spp., *Proteus* spp., *Enterobacter* spp.,
25 *Acinetobacter* spp. and *Stenotrophomonas* spp.) or fungi (such as yeasts and filamentous fungi, in particular *Candida* spp., *Aspergillus* spp., *Cryptococcus* spp., *Malassezia* spp., *Trichosporin* spp.), respectively bacterial or fungal DNA. The microarray is especially suitable for direct identification and characterisation of bacteria and *C. albicans*.

30 In a preferred aspect of embodiment (1) the analytical device is suitable for species specific identification of one microbial strain or (preferably) a plurality of microbial strains in clinical specimens comprising microbial strains, especially bacteria and/or fungi. It furthermore allows differentiation of the target species from each other

and from non-target-species contained in one sample comprising a plurality of microbial strains.

In one preferred aspect of embodiments (1), (2) and (3), the DNA microarray is feasible to identify and characterize any of the microorganisms, including the fungi and bacteria as defined above, known as etiological agents of fungemia, bacteremia or sepsis. In another preferred aspect of (1), it is feasible to characterize the bacteria known as etiological agents of bacteremia or sepsis. More preferably, it is feasible to identify and characterize at least 90 % of said microorganisms or bacteria. Equally more preferably it is feasible to identify and characterize microorganisms selected from the group consisting of *S. aureus*, *Coagulase-negative staphylococci*, *Enterococci*, *Streptococci*, *E. coli*, *Klebsiella* spp., *Proteus* spp, *P. aeruginosa*, *Acinetobacter* spp. and *Candida albicans*, most preferably microorganisms selected from the group consisting of *S. aureus*, CoNS (including *Staphylococcus epidermidis*, *Staphylococcus haemolyticus*, *Staphylococcus lugdunensis*, *Staphylococcus warneri*, *Staphylococcus saprophyticus*, *Staphylococcus hominis*), *C. albicans*, *Enterococcus faecalis*, *Enterococcus faecium*, *E. coli*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Proteus vulgaris*, *P. aeruginosa*, *Acinetobacter baumannii*, *Streptococcus agalactiae*, *Streptococcus bovis*, *Streptococcus mutans*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*.

In a first most preferred aspect of embodiment (1), the DNA microarray is suitable for species specific identification of microorganisms selected from the group consisting of *Staphylococci*, *E. coli* and *Candida* sp., preferably for species specific identification of *Staphylococci*, especially of *S. aureus*. More preferably, it is suitable for species specific identification of *Staphylococci* and at least one of *E. coli* and *Candida albicans*.

In a second most preferred aspect of embodiment (1), the DNA microarray is suitable to identify and characterize at least *S. aureus*, *Coagulase-negative staphylococci*, *E. coli*, *Enterococcus faecalis* and *faecium* and *Candida albicans*.

In addition to above aspects, the DNA microarray is in a preferred embodiment of present invention suitable for additional species specific identification or differentiation of *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Streptococcus*

pneumoniae, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Proteus mirabilis* and/or *Proteus vulgaris*.

The practicability and specificity of the DNA microarray for the identification and characterisation of *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas*
5 *aeruginosa* was evaluated with clinical isolates and positive blood cultures (Examples 1.1-1.10). Especially preferred is a microarray which allows identification and characterisation of *S. aureus*. The latter microarray allows the detection of every *S. aureus* isolate, unambiguously identifies most of important virulence genes such as *tsst-1*, *sea*, *seb*, *eta* and antibiotic resistance genes such as *mecA*, *aacA-*
10 *aphD*, *blaZ*, *ermA* and specifically distinguishes *S. aureus* from unrelated gram negative bacteria, e.g. *Escherichia coli* or *Pseudomonas aeruginosa*, as well as from closely related CoNS (Example 1.11, Fig. 2-6).

In another preferred aspect of the invention, the microarray of (1) is suitable for diagnosis of fungemia, bacteremia or sepsis; especially for diagnosis of bacteremia,
15 candidemia, and bacterial or *Candida* sepsis.

The present invention provides a novel approach for detection of microorganisms, especially of bacteria and fungi, by microarrays: using gene-segments it allows species identification by probing a large and diverse set of species-specific genes. Such an approach is reliable since it makes possible to identify a pathogen even
20 when some genes have been deleted from its genome. Furthermore, the selected DNA probes are at least 100 nt, preferably 200 to 800 nt long and are therefore not sensitive to single nucleotide polymorphisms or CG-content variations in the targets. Therefore, a gene segment array according to present invention is useful for indicating the presence of a gene even though the sequence may be slightly
25 altered e.g. by point mutations (Southern, E. et al., Nat. Genet. 21:5-9 (1999)). Additionally, it permits species virulence and antibiotics resistance profiling all together in a single-step test. Thus, present invention provides for a significant improvement compared to the classical approach focused on the detection of a short evolutionary conserved sequence like 16S RNA.

30 The number and perfect composition of gene-segments necessary for a correct species identification, virulence determination and resistance profiling must be determined by empiric specificity tests. Thus, in a preferred aspect of the invention, the DNA microarray of embodiment (1) comprises the minimal number of species

- specific gene probes which is sufficient for species identification, the minimal number of virulence gene probes which is sufficient for virulence determination, and/or the minimal number of resistance gene probes which is sufficient for determination of resistance of a specific microorganism. Preferably, the minimal number of gene probes in this aspect of the invention is: for correct species identification at least 1 species specific gene probes per target species, more preferably at least 2 different species specific gene probes per target species, even more preferably at least 10, most preferably at least 20; for virulence determination at least 1 gene probe per target species, more preferably at least 5 different gene probes, even more preferably at least 20 different gene probes, most preferably gene probes for all known virulence factors of each target species; for determination of resistance at least 1 gene probe per antibiotic class or resistance factor, more preferably at least 5 different gene probes, most preferably all known gene-coded resistance determinants in the target species.
- 15 Generally, the DNA microarray of embodiment (1) comprises gene probes which are specific for a microbial species, bacterial/fungal species or a group of microorganisms to be identified. Said gene probes are preferably DNA sequences selected from three different groups, namely (a) species specific gene probes; (b) virulence gene probes; and/or (c) resistance gene probes.
- 20 Preferably, the species specific set of gene probes for each species to be identified and characterised is selected from species specific gene probes (a) for
- (i) *Staphylococcus aureus* including gene probes derived from *clfA*, *clfB*, *coa*, *lytM*, *NAG*, *sodA*, *sodB*, *epiP-bsaP*, *geh*, *hemC*, *hemD*, *hsdS*, *lip*, *menC*, *nuc*, *SAV0431*, *SAV0440*, *SAV0441*, *spa*, *ebpS*, *fbpA*, *fib*, *fnbB*, *srtA*, *stpC*, *fnbA*, *femA*, *fmhB*,
 25 *fmhA*;
- (ii) *Escherichia coli* including gene probes derived from *b1169*, *fliCb*, *nfrB*, *yachH*, *ycdS*, *yciQ*, *shuA*;
- (iii) *Staphylococcus epidermidis* including gene probes derived from *ardeSE0106*, *ardeSE0107*, *atlE*, *agrB*, *alphSE1368*, *gad*, *glucSE1191*, *icaB*, *mvaSSepid*,
 30 *nitreSE1972*, *nitreSE1974*, *nitreSE1975*, *oiamtSE1209*, *ORF1Sepid*, *ORF3bSepid*, *qacR*, *ureSE1865*, *ureSE1867*;
- (iv) *Staphylococcus haemolyticus* including gene probes derived from *femBShaemolyt*, *mvaDShaemolyt*, *mvaSShaemolyticus*, *RNApolsigm*;

- (v) *Staphylococcus lugdunensis* including gene probes derived from *agrB2Stalugd*, *agrC2Stalugd*, *slamStalugd*;
- (vi) *Staphylococcus warneri* including gene probes derived from *msrw1Stwar*, *nukMStwar*, *proDStwar*, *proMStwar*, *sigrpoStwar*, *tnpStwar*;
- 5 (vii) *Staphylococcus saprophyticus* including gene probes derived from *RNApolsigmSsapro*;
- (viii) *Staphylococcus hominis* including gene probes derived from *ydhK*;
- (ix) *Candida albicans* including gene probes derived from *ARG56*, *ASL43f*, *BGL2*, *CCT8*, *CDC37*, *CEF3*, *CHS1*, *CHS2*, *CHS4*, *CHS5*, *CHT1*, *CHT2*, *CHT4*, *CSA1*,
 10 *5triphosphatase*, *AAF1*, *ADH1*, *ALS1*, *ALS7*, *EDT1*, *ELF*, *ESS1*, *FAL1*, *GAP1*, *GNA1*, *GSC1*, *GSL1*, *HIS1*, *HTS1*, *HWP1*, *HYR1*, *INT1a*, *KRE15f*, *KRE6*, *KRE9*, *MIG1*, *MLS1*, *MP65*, *NDE1*, *PFK2*, *PHR1*, *PHR2*, *PHR3*, *PRA1*, *PRS1*, *RBT1*, *RBT4*, *RHO1*, *RNR1*, *RPB7*, *RPL13*, *RVS167*, *SHA3*, *SKN1*, *SRB1*, *TCA1*, *TRP1*, *YAE1*, *YRB1*, *YST1exon2*;
- (x) *Enterococcus faecalis* including gene probes derived from *arcA*, *arcC*, *bkdA*,
 15 *camE1*, *csrA*, *dacA*, *dfr*, *dhoD1a*, *ABC-eltA*, *agrBfs*, *agrCfs*, *dnaE*, *ebsA*, *ebsB*, *eep*, *efaR*, *gls24_glsB*, *gph*, *gyrAEf*, *metEf*, *mntHCB2*, *mob2*, *mvaD*, *mvaE*, *parC*, *pcfG*, *phoZ*, *polC*, *ptb*, *recS1*, *rpoN*, *tms*, *tyrDC*, *tyrS*;
- (xi) *Enterococcus faecium* including gene probes derived from *bglB*, *bglR*, *bglS*, *efmA*, *efmB*, *efmC*, *mreC*, *mreD*, *mvaDEfaecium*, *mvaEEfaecium*, *mvaK1Efaecium*,
 20 *mvaK2Efaecium*, *mvaSEfaecium*, *orf3_4Efaeciumb*, *orf6_7Efaecium*, *orf7_8Efaecium*, *orf9_10Efaecium*;
- (xii) *Klebsiella pneumonia* including gene probes derived from *atsA*, *budC*, *citA*, *citW*, *citX*, *dalk*, *acoA*, *acoB*, *acoC*, *ahlK*, *fimK*, *glfKPN2*, *ltrA*, *mdcC*, *mdcH*, *nifF*, *nifK*, *nifN*, *tyrP*, *wbbO*, *wzb*, *wzmKPN2*, *wztKPN2*, *yohH*, *liac*;
- 25 (xiii) *Klebsiella oxytoca* including gene probes derived from *gatY*, *pelX*, *tagH*, *tagK*, *tagT*;
- (xiv) *Pseudomonas aeruginosa* including gene probes derived from *glpR*, *lasRb*, *OrfX*, *pa0260*, *pa0572*, *pa0625*, *pa0636*, *pa1046*, *pa1069*, *pa1846*, *pa3866*, *pa4082*, *pilAp*, *PilAp2*, *pilC*, *PstP*, *uvrDII*, *vsmI*, *vsmR*, *xcpX*;
- 30 (xv) *Streptococcus pneumoniae* including gene probes derived from *cap1EStrpneu*, *cap1FStrpneu*, *cap1GStrpneu*, *cap3AStrpneu*, *cap3BStrpneu*, *celAStrpneu*, *celBStrpneu*, *cglAStrpneu*, *cglBStrpneu*, *cglCStrpneu*, *cglDStrpneu*, *cinA*, *cps14EStrpneu*, *cps14FStrpneu*, *cps14GStrpneu*, *cps14HStrpneu*, *cps19aHStrpneu*, *cps19aIStrpneu*, *cps19aKStrpneu*, *cps19fGStrpneu*,

- cps23fGStrpneum*, *dexB*, *dinF*, *1760Strpneu*, *acyPStrpneu*, *endAStrpneu*, *exoAStrpneu*, *exp72*, *fnlAStrpneu*, *fnlBStrpneu*, *fnlCStrpneu*, *gct18Strpneum*, *hexB1*, *hftsHstrpneu*, *immunofrag1Strpneu*, *immunofrag2Strpneu*, *immunofrag3Strpneu*, *kdtBStrpneu*, *lysAStrpneu*, *pcpBStrpneu*, *pflCStrpneu*, *plpA*,
5 *prtA1Strpneu*, *pspC1Strpneu*, *pspC2*, *purRStrpneu*, *pyrDAStrpneum*, *SP0828Strpneu*, *SP0830Strpneu*, *SP0833Strpneu*, *SP0837_38Strpneu*, *SP0839Strpneu*, *ugdStrpneu*, *uncC*, *vicXStrpneu*, *wchA6bStrpneum*, *wci4Strpneum*, *wciK4Strpneum*, *wciL4Strpneum*, *wciN6bStrpneum*, *wciO6bStrpneum*, *wciP6bStrpneum*, *wciY18Strpneum*, *wzdbStrpneum*,
10 *wze6bStrpneum*, *wzy18Strpneum*, *wzy4Strpneum*, *wzy6bStrpneum*, *xpt*;
(xvi) *Streptococcus agalactiae* including gene probes derived from *cpsA1Strgal*, *cpsB1Strgal*, *cpsC1Strgal*, *cpsD1Strgal*, *cpsE1Strgal*, *cpsG1Strgal*, *cpsIStragal*, *cpsJStragal*, *cpsKStragal*, *cpsMStragal*, *cpsYStragal*, *cylBStraga*, *cylEStraga*, *cylFStraga*, *cylHStraga*, *cylIStraga*, *cylJStraga*, *cylKStraga*, *0487Straga*,
15 *0488Straga*, *0493Straga*, *0495Straga*, *0498Straga*, *0500Straga*, *0502Straga*, *0504Straga*, *foldStraga*, *neuA1Strgal*, *neuB1Strgal*, *neuC1Strgal*, *neuD1Strgal*, *recNStraga*, *ileSStraga*;
(xvii) *Streptococcus pyogenes* including gene probes derived from *cyclStrpyog*, *fah_rph_hlo_Strpyog*, *int*, *int315.5*, *oppD*, *SPy0382Strpyog*, *SPy0390Strpyog*,
20 *SpyM3_1351*, *vicXStrpyog*;
(xviii) *Streptococcus mutans* including gene probes derived from *573Stprmut*, *580SStprmut*, *581_582SStprmut*, *584SStprmut*, *dltAStrmut*, *dltBStrmut*, *dltCpplx1Strmut*, *dltDStrmut*, *lichStrbov*, *lytRStprmut*, *lytSStprmut*, *pepQStrmut*, *pflCStrmut*, *recNStprmut*, *ytqBStrmut*;
25 (xix) *Proteus mirabilis* including gene probes derived from *atfA*, *atfB*, *atfC*, *ccmPrmi1*, *cyaPrmi*, *flfB*, *flfD*, *flfN*, *flhD*, *floA*, *ftsK*, *gstB*, *hemCPrmi*, *hemDPrmi*, *hev*, *katA*, *lpp1*, *menE*, *mfd*, *nrpA*, *nrpB*, *nrpG*, *nrpS*, *nrpT*, *nrpU*, *pat*, *pmfA*, *pmfC*, *pmfE*, *ppaA*, *rsbA*, *rsbC*, *speB*, *stmA*, *stmB*, *terA*, *terD*, *umoA*, *umoB*, *umoC*, *ureR*, *xerC*, *ygbA*;
30 (xx) *Proteus vulgaris* including gene probes derived from *envZPrvu*, *frdC*, *frdD*, *lad*, *tna2*;
(xxi) *Acinetobacter baumannii* including gene probes derived from *carO*, *gacS*, *dhbA*, *dhbB*, *sid*, *csuD*, *csuC*, *tnp-ACIBA*, *waaA-ACIBA*, *csuB*, *csuA_B*, *csuA*, *put1*, *por*, *abc*, *furACIBA*, *dec*, *cysI*, *trpE*, *put3*, *ompA-ACIBA*.

Preferably, the virulence specific set of gene probes for each species to be identified and characterised is selected from virulence gene probes (b) for

- (i) *Staphylococcus aureus* including gene probes derived from *bsaE*, *bsaG*, *cap5h*, *cap5i*, *cap5j*, *cap5k*, *cap8H*, *cap8I*, *cap8J*, *cap8K*, *I-hld*, *I-hysA*, *I-IgGbg*, *EDIN*, *eta*,
5 *etb*, *hglA*, *hglB*, *hglC*, *hla*, *hlyB*, *lukF*, *lukS*, *NAG*, *sak*, *sea*, *seb*, *sec1*, *seg*, *seh*, *sel*,
set15, *set6*, *set7*, *set8*, *sprV8*, *tst*, *I-sdrC*, *I-sdrD*, *I-sdrE*;
- (ii) *Escherichia coli* including gene probes derived from *b1202*, *eae*, *eltB*, *escR*,
escT, *escU*, *espB*, *fes*, *fteA*, *hlyA*, *hlyB*, *iucA*, *iucB*, *iucC*, *papG*, *rfbE*, *shuA*, *SLTII*,
toxA-LTPA, *VT2vaB*;
- 10 (iii) *Staphylococcus epidermidis* including gene probes derived from *gcaD*, *hld_orf5*,
icaC, *icaD*, *icaR*, *psm_beta1and2*, *purR*, *spoVG*, *yabJ*;
- (iv) *Staphylococcus haemolyticus* including gene probes derived from *lipShaemolyt*;
- (v) *Staphylococcus lugdunensis* including gene probes derived from *fblStalugd*,
slushABCStalugd;
- 15 (vi) *Staphylococcus warneri* including gene probes derived from *gehAStwar*;
- (vii) *Candida albicans* including gene probes derived from *CCN1*, *CDC28*, *CLN2*,
CPH1, *CYB1*, *EFG1*, *MNT1*, *RBF1*, *RBF1*, *RIM101*, *RIM8*, *SEC14*, *SEC4*, *TUP1*, *YPT1*,
ZNF1CZF1;
- (viii) *Enterococcus faecalis* including gene probes derived from *asa1*, *asp1*, *cgh*,
20 *cylA*, *cylB*, *cylI*, *cylL_cylS*, *cylM*, *ace*, *ef00108*, *ef00109*, *ef0011*, *ef00113*, *ef0012*,
ef0022, *ef0031*, *ef0032*, *ef0040*, *ef0058*, *enlA*, *esa*, *esp*, *gelE*, *groEL*, *groES*, *rt1*,
sala, *salb*, *sea1*, *sep1*, *vick*, *yycH*, *yycI*, *yycJ*;
- (ix) *Enterococcus faecium* including gene probes derived from *entA_entI*, *entD*,
entR, *oep*, *sagA*;
- 25 (x) *Klebsiella pneumonia* including gene probes derived from *cim*, *aldA*, *hemly*,
pSL017, *pSL020*, *rcaA*, *rmlC*, *rmlD*, *waaG*, *wbbD*, *wbbM*, *wbbN*, *wbdA*, *wbdC*,
wztKpn, *yibD*;
- (xi) *P. aeruginosa* including gene probes derived from *aprA*, *aprE*, *ctx*, *algB*, *algN*,
algR, *ExoS*, *fpvA*, *lasRa*, *lipA*, *lipH*, *Orf159*, *Orf252*, *pchG*, *PhzA*, *PhzB*, *PLC*, *plcN*,
30 *plcR*, *pvdD*, *pvdF*, *pyocinS1*, *pyocinS1im*, *pyocinS2*, *pys2*, *rbf303*, *rhlA*, *rhlB*, *rhlR*,
TnAP41, *toxA*;
- (xii) *Streptococcus pneumoniae* including gene probes derived from *igaStrpneu*,
lytA, *nanA*, *nanBStrpneu*, *pcpCStrpneu*, *ply*, *prtAStrpneu*, *pspA*, *SP0834Strpneu*,
sphtraStrpneu, *wciJStrpneu*, *wziyStrpneu*, *wzxStrpneu*;

(xiii) *Streptococcus agalactiae* including gene probes derived from *CAMPfactor*, *0499Straga*, *hylStragal*, *lipStragal*;

(xiv) *Streptococcus pyogenes* including gene probes derived from *DNaseIStrpyog*, *fba2Strpyog*, *fhuAStrpyog*, *fhuB1Strpyog*, *fhuDStrpyog*, *fhuGStrpyog*, *hlyA*, *hlyP*,
 5 *hlyp2*, *oppB*, *ropB*, *scpAStrpyog*, *sloStrpyog*, *smez- Strpyog*, *sof*, *speA*,
speB2Strpyog, *speCStrpyog*, *speJStrpyog*, *srtBStrpyog*, *srtCStrpyog*, *srtEStrpyog*,
srtFStrpyog, *srtGStrpyog*, *srtIStrpyog*, *srtKStrpyog*, *srtRStrpyog*, *srtTStrpyog*,
vickStrpyog;

(xv) *Streptococcus mutans* including gene probes derived from *hlyXStrmut*,
 10 *perMStrmut*;

(xvi) *Proteus mirabilis* including gene probes derived from *flaA*, *laD*, *fliA*, *hpmA*,
hpmB, *lpsPrmi*, *mrpA*, *mrpB*, *mrpC*, *mrpD*, *mrpE*, *mrpF*, *mrpG*, *mrpH*, *mrpI*, *mrpJ*,
patA, *putA*, *uca*, *ureDPrmi*, *ureEPrmi*, *ureFPrmi*, *zapA*, *zapB*, *zapD*, *zapE*.

Preferably, the resistance specific set of gene probes is selected from resistance
 15 gene probes (c) derived from genes coding for

(i) beta-lactams resistance including gene probes derived from *blaIMP-7*,
mecISepid, *blaOXA-10*, *blaB*, *ampC*, *I-blaR*, *blaOXA-32*, *bla-CTX-M-22*,
pbp2aStrpneu, *blaSHV-1*, *blaOXA-2*, *blaRShaemolyt*, *blaIMP-7*, *I-mecR*, *blaOXY*,
dacCStrpyog, *mecA*, *blaIShaemolyt*, *blavim*, *pbp2b*, *pbp2primeSepid*, *pbp2x*,
 20 *pbp3Saureuc*, *pbp4*, *pbp5Efaecium*, *pbpC*, *I-mecI*, *pbp1a*, *I-blaI*, *blaTEM-106*,
blaOXY-KLOX, *ftsWEF*, *cumA*, *blaPER-1*, *bla_FOX-3*, *blaA*, *psrb*, *mecR1Sepid*, *blaZ*,
blaOXA-1, *fox-6*, *blaPrmi*;

(ii) aminoglycosides resistance including gene probes derived from
aacA_aphDStwar, *aacC1*, *aacC2*, *strB*, *aadA*, *aadB*, *aadD*, *aacA4*, *strA*, *aph-A3*,
 25 *aacC1*, *aacA4*, *aacA-aphD*, *I-spc*, *aphA3*; *aacA4ENCL*, *aac(6p)-lb7*;

(iii) macrolides-lincosamines-streptogramins resistance including gene probes
 derived from *ermC*, *linB*, *satSA*, *mdrSA*, *I-linA*, *ermB*, *ermA*, *sata*, *msrA*, *mphBM*,
mefA, *mrx*;

(iv) trimethoprim resistance including gene probes derived from *dfrA*, *dfrStrpneu*;

(v) chloramphenicol resistance including gene probes derived from *cat*,
 30 *catEfaecium*, *cmlA5*;

(vi) tetracyclines resistance including gene probes derived from *tetAJ*, *tetL*, *tetM*;

(vii) glycopeptides resistance including gene probes derived from *vanH(tn)*, *vanA*, *vanHB2*, *vanR*, *vanRB2*, *vanS(tn)*, *vanSB2*, *vanWB2*, *ddl*, *ble*, *vanXB2*, *vanY(tn)*, *vanYB2*, *vanB*, *vanZ(tn)*, *vanC-2*, *vanX(tn)*;

(viii) multiple target resistance including gene probes derived from *acrB*, *mexB*, *I-qacA*, *sulI*, *sul*, *cadBStalugd*, *mexA*, *acrR*, *emeA*, *acrA*, *rtn*, *abcXStrpmut*, *qacEdelta1*, *elkT-abcA*, *I-cadA*, *albA*, *wzm*, *msrCb*, *nov*, *wzt*, *wbbl*, *norA23*, *mexR*, *arr2*, *mreA*, *I-cadC*, *uvrA*, *AdeR-ACIBA*, *adeA-ACIBA*, *adeB-ACIBA*, *adeC-ACIBA*, *AdeS-ACIBA*;

(ix) fungicides resistance, especially *C. albicans* fungicide resistance, including gene probes derived from *CRD2*, *CDR1*, *MET3*, *FET3*, *FTR2*, *MDR1-7*, *ERG11*, *SEC20*.

Most preferably, the resistance specific set of gene probes is selected from resistance gene probes (c) derived from genes coding for

(i) beta-lactams resistance including gene probes derived from *bla-CTX-M-22*, *blaSHV-1*, *blaTEM-106*, *mecA*, *blaZ*;

(ii) aminoglycosides resistance including gene probes derived from *aacC1*, *aacC2*, *aadA*, *aadB*, *aadD*, *aacA4*, *aph-A3*, *aacC1*, *aacA4*, *aacA-aphD*, *aphA3*;

(iii) macrolides-lincosamines-streptogramins resistance including gene probes derived from *ermA*, *ermB*, *ermC*;

(iv) tetracyclines resistance including gene probes derived from *tetA_J*, *tetL*, *tetM*

(vii) glycopeptides resistance including gene probes derived from *vanA*, *vanB*, *vanC-2*.

The most relevant resistance gene probes are probes derived from and specific for *mecA*. This is due to the fact that *mecA* is common to all Staphylococci including *S. aureus* and CoNS.

Since the same resistance phenotype is determined by many different genotypes, it is preferred to use a plurality of resistance gene probes for unambiguous and comprehensive prediction of antibiotic resistance. The largest available set of resistance probes is most preferred.

For the virulence assessment of a certain strain and the sub-species strain discrimination, it is preferred to use a plurality of virulence gene probes for unambiguous and comprehensive virulence determination. The use of the highest available number of genotypic markers is most favourable.

Furthermore, the microarray may contain a set of gene probes which serve as controls. Preferably, such a set of control gene probes is selected from group (d) consisting of control gene probes coding for

- 5 (i) negative controls, namely DNA sequences which will not hybridise with human DNA or bacterial, fungal or the microbial target DNA under the hybridisation conditions of the method of present invention, including gene probes derived neither from fungal, bacterial or target microbial nor from human genes, preferably gene probes derived from plant genes, more preferably from *Arabidopsis thaliana* or *Glycine max* genes;
- 10 (ii) positive controls including segments of ribosomal DNA from bacterial target species, preferably 16S DNA, and segments of conserved human genes;
- (iii) positive controls specific for DNA added to the sample ("spiked DNA"), namely DNA sequences which will not hybridise with human DNA or the fungal, bacterial or microbial target DNA under the hybridisation conditions of the method of present invention, including gene probes derived neither from fungal, bacterial or target
- 15 microbial nor from human genes, preferably gene probes derived from mouse or amoeba genes, most preferably from *Mus musculus* or *Dictyostelium discoideum* genes.

These control gene probes are necessary to

- 20 a) detect non-specific hybridisation;
- b) optimise hybridisation conditions and image acquisition and analysis;
- c) provide positive controls for the quality of probe preparation, hybridisation and detection; and/or
- d) control technical aspects of the entire detection procedure including
- 25 labelling, hybridisation and detection steps.

In a preferred aspect of embodiment (1), the microarray contains DNA sequences selected from the group consisting of the SEQ ID NOs: 1-918 and 2842-2908, complementary sequences thereto, addition mutants, deletion mutants, substitution mutants and homologues thereof as gene probes.

- 30 More preferably, in order to identify a specific microbial species, bacterial species or group of bacteria, the gene probes of group (a) are selected from SEQ ID NO:1-99, 142-152, 174-199, 209-214, 216-219, 222-229, 231-291, 308-342, 377-393, 399-431, 449-490, 523-591, 606-639, 645-656, 687-701, 706-749, 776-781, 2843-

2863, 2902 and 2903 (compare Tab. 1). Equally, in order to determine virulence of a specific micororganism or bacterial species, the gene probes of group (b) are selected from SEQ ID NO: 100-141, 153-173, 200-208, 215, 220-221, 230, 292-307, 343-376, 394-398, 432-448, 491-522, 592-605, 640-644, 657-686, 702-705, 750-775 and 782-784 (compare Tab. 1). Equally, in order to determine antibiotic resistance of a specific microbial or bacterial species, the gene probes of group (c) are selected from SEQ ID NO:785-918, 2864-2875, 2888 and 2907-2908, preferably from SEQ ID NO:785-909, 2864-2875, 2888 and 2907-2908 (compare Tab. 1). Equally, in order to provide the required controls (negative, positive, hybridisation controls), the gene probes of group (d) are selected from SEQ ID NO:919-947, preferably from SEQ ID NO:919-925 and 944-947, more preferably from SEQ ID NO: 919 and 921 (compare Tab. 1).

Tab. 1: Preferred gene probes for species identification, virulence determination and resistance determination of microorganisms

15 a) probes for species identification

SEQ ID NO	Probe
1	cataSaur_1_1
2	cataSaur_1_2
3	clfA_1_1
4	clfB_1_1
5	coa_1_1
6	coa_1_2
7	I-clpC_1_1
8	I-clpP_1_1
9	I-ctaA_1_1
10	I-ctsR_1_1
11	I-dltA_1_1
12	I-dltB_1_1
13	I-dltC_1_1
14	I-dnaK_1_1
15	I-elkT_1_1
16	I-femD_1_1
17	I-glnA_1_1
18	I-glnR_1_1
19	I-grlA_1_1
20	I-grlB_1_1
21	I-groEL_1_1
22	I-groES_1_1
23	I-hemA_1_1
24	I-hemE_1_1
25	I-hemH_1_1
26	I-hemL_1_1
27	I-hemY_1_1
28	I-lepA_1_1

SEQ ID NO	Probe
29	I-lrgA_1_1
30	I-lrgB_1_1
31	I-lytM_1_1
32	I-menB_1_1
33	I-menD_1_1
34	I-menE_1_1
35	I-menF_1_1
36	I-mreB_1_1
37	I-mreR_1_1
38	I-mutL_1_1
39	I-mutS_1_1
40	I-NAG_1_1
41	I-pbg_1_1
42	I-pbpF_1_1
43	I-pdhB_1_1
44	I-pdhC_1_1
45	I-rsbU_1_1
46	I-rsbV_1_1
47	I-rsbW_1_1
48	I-sgp_1_1
49	I-sirR_1_1
50	I-sodA_1_1
51	I-sodB_1_1
52	I-sstA_1_1
53	I-sstB_1_1
54	I-sstC_1_1
55	I-sstD_1_1
56	I-trx_1_1
57	I-yhiN_1_1
58	epiP-bsaP_1_1
59	geh_1_1
60	gyrA_1_1
61	gyrB_1_1
62	hemB_1_1
63	hemC_1_1
64	hemD_1_1
65	hemN_1_1
66	hsdS_1_1
67	hsdS_2_1
68	lip_1_1
69	menC_1_1
70	murC_1_1
71	nuc_1_1
72	pdhD_1_1
73	rpoB_1_1
74	SAV0431_1_1
75	SAV0439_1_1
76	SAV0440_1_1
77	SAV0441_1_1
78	sigB_1_1
79	spa_1_2
80	sstC_1_1
81	tag_1_1

SEQ ID NO	Probe
82	tyrA_1_1
83	I-aroC_1_1
84	I-aroA_1_1
85	I-cna_1_1
86	I-ebpS_1_1
87	I-eno_1_1
88	I-fbpA_1_1
89	I-fib_1_1
90	I-fnbB_1_1
91	I-srtA_1_1
92	I-stpC_1_1
93	I-fnbA_1_1
94	I-spa_1_1
95	I-aroE_1_1
96	I-aroF_1_1
97	I-aroG_1_1
98	I-asp23_1_1
99	I-atl_1_1
142	b1169_1_1
143	envZ_1_1
144	fliCb_1_1
145	nfrB_1_1
146	nlpA_1_1
147	pilAe_1_1
148	yacH_1_1
149	yagX_1_1
150	ycdS_1_1
151	yciQ_1_1
152	ymcA_1_1
174	ardeSE0106_1_1
175	ardeSE0107_1_1
176	aroI SE0105_1_1
177	atIE_1_1
178	agrB_1_1
179	agrC_1_1
180	alphSE1368_1_1
181	gad_1_1
182	glucSE1191_1_1
183	hsp10_1_1
184	icaA_1_1
185	icaB_1_1
186	mvaSSepid_1_1
187	nitreSE1972_1_1
188	nitreSE1974_1_1
189	nitreSE1975_1_1
190	oiamtSE1209_1_1
191	ORF1Sepid_1_1
192	ORF3bSepid_1_1
193	qacR_1_1
194	sin_1_1
195	ureSE1861_1_1
196	ureSE1863_1_1
197	ureSE1864_1_1

SEQ ID NO	Probe
198	ureSE1865_1_1
199	ureSE1867_1_1
209	folQShaemolyt_1_1
210	mvaCShaemolyticus_1_1
211	mvaDShaemolyt_1_1
212	mvaK1Shaemolyticus_1_1
213	mvaSShaemolyticus_1_1
214	RNApolsigm_1_1
216	agrB2Stalugd_1_1
217	agrC2Stalugd_1_1
218	agrCStalugd_1_1
219	slamStalugd_1_1
222	RNApolsigmSsapro_1_1
223	RNApolsigmSsapro_1_2
224	msrw1Stwar_1_1
225	nukMStwar_1_1
226	proDStwar_1_1
227	proMStwar_1_1
228	sigrpoStwar_1_1
229	tnpStwar_1_1
231	ARG56_1_1
232	ASL43f_1_1
233	BGL2_1_1
234	CACHS3_1_1
235	CCT8_1_1
236	CDC37_1_1
237	CEF3_1_1
238	CHS1_1_1
239	CHS2_1_1
240	CHS4_1_1
241	CHS5_1_1
242	CHT1_1_1
243	CHT2_1_1
244	CHT4_1_1
245	CSA1_1_1
246	5triphosphatase_1_1
247	AAF1_1_1
248	ADH1_1_1
249	ALS1_1_1
250	ALS7_1_1
251	EDT1_1_1
252	ELF_1_1
253	ESS1_1_1
254	FAL1_1_1
255	GAP1_1_1
256	GNA1_1_1
257	GSC1_1_1
258	GSL1_1_1
259	HIS1_1_1
260	HTS1_1_1
261	HWP1_2_1
262	HYR1_1_1
263	INT1a_1_1

SEQ ID NO	Probe
264	KRE15f_1_1
265	KRE6_1_1
266	KRE9_1_1
267	MIG1_1_1
268	MLS1_1_1
269	MP65_1_1
270	NDE1_1_1
271	PFK2_1_1
272	PHR1_1_1
273	PHR2_1_1
274	PHR3_1_1
275	PRA1_1_1
276	PRS1_1_1
277	RBT1_1_1
278	RBT4_1_1
279	RHO1_1_1
280	RNR1_1_1
281	RPB7_1_1
282	RPL13_1_1
283	RVS167_1_1
284	SHA3_1_1
285	SKN1_1_1
286	SRB1_1_1
287	TCA1_1_1
288	TRP1_1_1
289	YAE1_1_1
290	YRB1_1_1
291	YST1exon2_1_1
308	arcA_1_1
309	arcC_1_1
310	bkdA_1_1
311	cad_1_1
312	camE1_1_1
313	csrA_1_1
314	dacA_1_1
315	dfr_1_1
316	dhoD1a_1_1
317	ABC-eltA_1_1
318	agrBfs_1_1
319	agrCfs_1_1
320	dnaE_1_1
321	ebsA_1_1
322	ebsB_1_1
323	eep_1_1
324	efaR_1_1
325	glS24_glsB_1_1
326	gph_1_1
327	gyrAEf_1_1
328	metEf_1_1
329	mntHCb2_1_1
330	mob2_1_1
331	mvaD_1_1
332	mvaE_1_1

SEQ ID NO	Probe
333	parC_1_1
334	pcfG_1_1
335	phoZ_1_1
336	polC_1_1
337	ptb_1_1
338	recS1_1_1
339	rpoN_1_1
340	tms_1_1
341	tyrDC_1_1
342	tyrS_1_1
377	bglB_1_1
378	bglR_1_1
379	bglS_1_1
380	efmA_1_1
381	efmB_1_1
382	efmC_1_1
383	mreC_1_1
384	mreD_1_1
385	mvaDEfaecium_1_1
386	mvaEEfaecium_1_1
387	mvaK1Efaecium_1_1
388	mvaK2Efaecium_1_1
389	mvaSEfaecium_1_1
390	orf3_4Efaeciumb_1_1
391	orf6_7Efaecium_1_1
392	orf7_8Efaecium_1_1
393	orf9_10Efaecium_1_1
399	atsA_1_1
400	atsB_1_1
401	budC_1_1
402	citA_1_1
403	citW_1_1
404	citX_1_1
405	dalD_1_1
406	dalk_1_1
407	dalT_1_1
408	acoA_1_1
409	acoB_1_1
410	acoC_1_1
411	ahlK_1_1
412	fimK_1_1
413	glfKPN2_1_1
414	ltrA_1_1
415	mdcC_1_1
416	mdcF_1_1
417	mdcH_1_1
418	mrkA_1_1
419	mtrK_1_1
420	nifF_1_1
421	nifK_1_1
422	nifN_1_1
423	tyrP_1_1
424	ureA_1_1

SEQ ID NO	Probe
425	wbbO_1_1
426	wza_1_1
427	wzb_1_1
428	wzmKPN2_1_1
429	wztKPN2_1_1
430	yojH_1_1
431	liac_1_1
449	cymA_1_1
450	cymD_1_1
451	cymE_1_1
452	cymH_1_1
453	cymI_1_1
454	cymJ_1_1
455	ddrA_1_1
456	fdt-1_1_1
457	fdt-2_1_1
458	fdt-3_1_1
459	gatY_1_1
460	hydH_1_1
461	masA_1_1
462	nasA_1_1
463	nasE_1_1
464	nasF_1_1
465	pehX_1_1
466	pelX_1_1
467	tagH_1_1
468	tagK_1_1
469	tagT_1_1
470	glpR_1_1
471	lasRb_1_1
472	OrfX_1_1
473	pa0260_1_1
474	pa0572_1_1
475	pa0625_1_1
476	pa0636_1_1
477	pa1046_1_1
478	pa1069_1_1
479	pa1846_1_1
480	pa3866_1_1
481	pa4082_1_1
482	pilAp_1_1
483	PilAp2_1_1
484	pilC_1_1
485	PstP_1_1
486	purK_1_1
487	uvrDII_1_1
488	vsmI_1_1
489	vsmR_1_2
490	xcpX_1_1
523	cap1EStrpneu_1_1
524	cap1FStrpneu_1_1
525	cap1GStrpneu_1_1
526	cap3AStrpneu_1_1

SEQ ID NO	Probe
527	cap3BStrpneu_1_1
528	celAStrpneu_1_1
529	celBStrpneu_1_1
530	cglAStrpneu_1_1
531	cglBStrpneu_1_1
532	cglCStrpneu_1_1
533	cglDStrpneu_1_1
534	cinA_1_1
535	cps14EStrpneum_1_1
536	cps14FStrpneum_1_1
537	cps14GStrpneum_1_1
538	cps14HStrpneum_1_1
539	cps19aHStrpneum_1_1
540	cps19aIStrpneum_1_1
541	cps19aKStrpneum_1_1
542	cps19fGStrpneum_1_1
543	cps23fGStrpneum_1_1
544	dexB_1_1
545	dinF_1_1
546	1760Strpneu_1_1
547	acyPStrpneu_1_1
548	endAStrpneu_1_1
549	exoAStrpneu_1_1
550	exp72_1_1
551	fnlAStrpneu_1_1
552	fnlBStrpneu_1_1
553	fnlCStrpneu_1_1
554	gct18Strpneum_1_1
555	hexB1_1_1
556	hftsHStrpneu_1_1
557	immunofrag1Strpneu_1_1
558	immunofrag2Strpneu_2_1
559	immunofrag3Strpneu_2_1
560	kdtBStrpneu_1_1
561	lysAStrpneu_1_1
562	pcpBStrpneu_1_1
563	pflCStrpneu_1_1
564	plpA_1_1
565	prtA1Strpneu_1_1
566	pspC1Strpneu_1_1
567	pspC2_1_1
568	purRStrpneu_1_1
569	pyrDAStrpneum_1_1
570	SP0828Strpneu_1_1
571	SP0830Strpneu_1_1
572	SP0833Strpneu_1_1
573	SP0837_38Strpneu_1_1
574	SP0839Strpneu_1_1
575	ugdStrpneu_1_1
576	uncC_1_1
577	vicXStrpneu_1_1
578	wchA6bStrpneum_1_1
579	wci4Strpneum_1_1

SEQ ID NO	Probe
580	wciK4Strpneum_1_1
581	wciL4Strpneum_1_1
582	wciN6bStrpneum_1_1
583	wciO6bStrpneum_1_1
584	wciP6bStrpneum_1_1
585	wciY18Strpneum_1_1
586	wzdbStrpneum_1_1
587	wze6bStrpneum_1_1
588	wzy18Strpneum_1_1
589	wzy4Strpneum_1_1
590	wzy6bStrpneum_1_1
591	xpt_1_1
606	cpsA1Strgal_1_1
607	cpsB1Strgal_1_1
608	cpsC1Strgal_1_1
609	cpsD1Strgal_1_1
610	cpsE1Strgal_1_1
611	cpsG1Strgal_1_1
612	cpsIStrgal_1_1
613	cpsJStrgal_1_1
614	cpsKStrgal_1_1
615	cpsMStrgal_1_1
616	cpsYStrgal_1_1
617	cpsYStrgal_2_1
618	cylBStraga_1_1
619	cylEStraga_1_1
620	cylFStraga_1_1
621	cylHStraga_1_1
622	cylIStraga_1_1
623	cylJStraga_1_1
624	cylKStraga_1_1
625	0487Straga_1_1
626	0488Straga_1_1
627	0493Straga_1_1
628	0495Straga_1_1
629	0498Straga_1_1
630	0500Straga_1_1
631	0502Straga_1_1
632	0504Straga_1_1
633	foldStraga_1_1
634	neuA1Strgal_1_1
635	neuB1Strgal_1_1
636	neuC1Strgal_1_1
637	neuD1Strgal_1_1
638	recNStraga_1_1
639	ileSStraga_1_1
645	cyclStrpyog_1_1
646	fah_rph_hlo_Strpyog_1_1
647	int_1_1
648	int315.5_1_1
649	murEStrpyog_1_1
650	oppA_1_1
651	oppCStrpyog_1_1

SEQ ID NO	Probe
652	oppD_1_1
653	SPy0382Strpyog_1_1
654	SPy0390Strpyog_1_1
655	SpyM3_1351_1_1
656	vicXStrpyog_1_1
687	573Stprmut_1_1
688	580SStprmut_1_1
689	581_582SStprmut_1_1
690	584SStprmut_1_1
691	dltAStrmut_1_1
692	dltBStrmut_1_1
693	dltCpplx1Strmut_1_1
694	dltDStrmut_1_1
695	lichStrbov_1_1
696	lytRStprmut_1_1
697	lytSStprmut_1_1
698	pepQStrrmut_1_1
699	pflCStrmut_1_1
700	recNStprmut_1_1
701	ytqBStrmut_1_1
706	atfA_1_1
707	atfB_1_1
708	atfC_1_1
709	ccmPrmi1_1_1
710	cyaPrmi_1_1
711	aad_1_1
712	flfB_1_1
713	flfD_1_1
714	flfN_1_1
715	flhD_1_1
716	floA_1_1
717	ftsK_1_1
718	gstB_1_1
719	hemCPrmi_1_1
720	hemDPrmi_1_1
721	hev_1_1
722	katA_1_1
723	lpp1_1_1
724	menE_1_1
725	mfd_1_1
726	nrpA_1_1
727	nrpB_1_1
728	nrpG_1_1
729	nrpS_1_1
730	nrpT_1_1
731	nrpU_1_1
732	pat_1_1
733	pmfA_1_1
734	pmfC_1_1
735	pmfE_1_1
736	ppaA_1_1
737	rsbA_1_1
738	rsbC_1_1

SEQ ID NO	Probe
739	speB_1_1
740	stmA_1_1
741	stmB_1_1
742	terA_1_1
743	terD_1_1
744	umoA_1_1
745	umoB_1_1
746	umoC_1_1
747	ureR_1_1
748	xerC_1_1
749	ygbA_1_1
776	envZPrvu_1_1
777	frdC_1_1
778	frdD_1_1
779	infBPrvu_1_1
780	lad_1_1
781	tna2_1_1
2843	carO_1_1
2844	gacS_1_1
2845	dhbA_1_1
2846	dhbB_1_1
2847	sid_1_1
2848	csuD_1_1
2849	csuC_1_1
2850	tnp-ACIBA_1_1
2851	waaA-ACIBA_1_1
2852	csuB_1_1
2853	csuA_B_1_1
2854	csuA_1_1
2855	put1_1_1
2856	por_1_1
2857	abc_1_1
2858	furACIBA_1_1
2859	dec_1_1
2860	cysI_1_1
2861	trpE_1_1
2862	put3_1_1
2863	ompA-ACIBA_1_1
2902	coa_3_1
2903	coa_2_2
2876	asr_1_1
2877	lacZ_1_1
2878	ehuS_1_1
2879	ehuV_1_1
2880	slyA_1_1
2881	ORF165_1_1
2882	ehuU_1_1
2883	ehuT_1_1
2884	ORF295_1_1
2885	ehuA_1_1
2886	ORF400_1_1
2887	H+ATPase_1_1
2889	smeE_1_1

SEQ ID NO	Probe
2890	eE_1_1
2891	StmPr1_1_1
2892	eD_2_1
2893	ppi_1_1
2894	pmp-STEMA_1_1
2895	pam_1_1
2896	ORF4-STEMA_1_1
2897	ORF2-STEMA_1_1
2898	et_1_1
2899	eF_1_1
2900	StmPr2_1_1
2901	smeF4494_1_1
2904	fasCAXStrdysg_1_1
2906	ydhK_1_1

b) virulence probes

SEQ ID NO	Probe
100	bsaE_1_1
101	bsaG_1_1
102	cap5h_1_1
103	cap5i_1_1
104	cap5j_1_1
105	cap5k_1_1
106	cap8H_1_1
107	cap8I_1_1
108	cap8J_1_1
109	cap8K_1_1
110	I-hld_1_1
111	I-hysA_1_1
112	I-IgGbg_1_1
113	EDIN_1_1
114	eta_1_1
115	etb_1_1
116	hglA_1_1
117	hglA_2_1
118	hglB_1_1
119	hglC_2_1
120	hla_1_1
121	hlb_1_2
122	lukF_1_1
123	lukS_1_1
124	lukS_2_1
125	NAG_1_1
126	sak_1_1
127	sea_1_1
128	seb_1_1
129	sec1_1_1
130	seg_1_1
131	seh_1_1
132	sel_1_1
133	set15_1_1

SEQ ID NO	Probe
134	set6_1_1
135	set7_1_1
136	set8_1_1
137	sprV8_1_1
138	tst_1_1
139	I-sdrC_1_1
140	I-sdrD_1_1
141	I-sdrE_1_1
153	b1202_1_1
154	eae_1_1
155	eltB_1_1
156	escR_1_1
157	escT_1_1
158	escU_1_1
159	espB_1_1
160	fes_1_1
161	fes_2_1
162	fteA_1_1
163	hlyA_1_1
164	hlyB_1_1
165	iucA_1_1
166	iucB_1_1
167	iucC_1_1
168	papG_1_1
169	rfbE_1_1
170	shuA_1_1
171	SLTII_1_1
172	toxA-LTPA_1_1
173	VT2vaB_1_1
200	gcaD_1_1
201	hld_orf5_1_1
202	icaC_1_1
203	icaD_1_1
204	icaR_1_1
205	psm_beta1and2_1_1
206	purR_1_1
207	spoVG_1_1
208	yabJ_1_1
215	lipShaemolyt_1_1
220	fblStalugd_1_1
221	slushABCStalugd_1_1
230	gehAStwar_1_1
292	CCN1_1_1
293	CDC28_1_1
294	CLN2_1_1
295	CPH1_1_1
296	CYB1_1_1
297	EFG1_1_1
298	MNT1_1_1
299	RBF1_1_1
300	RBF1_2_1
301	RIM101_1_1
302	RIM8_1_1

SEQ ID NO	Probe
303	SEC14_1_1
304	SEC4_1_1
305	TUP1_1_1
306	YPT1_1_1
307	ZNF1CZF1_2_1
343	asa1_1_1
344	asp1_1_1
345	cgh_1_1
346	cylA_1_1
347	cylB_1_1
348	cylI_1_1
349	cylL_cylS_1_1
350	cylM_1_1
351	ace_1_1
352	ef00108_1_1
353	ef00109_1_1
354	ef0011_1_1
355	ef00113_1_1
356	ef0012_1_1
357	ef0022_1_1
358	ef0031_1_1
359	ef0032_1_1
360	ef0040_1_1
361	ef0058_1_1
362	enlA_1_1
363	esa_1_1
364	esp_1_1
365	gelE_1_1
366	groEL_1_1
367	groES_1_1
368	rt1_1_1
369	sala_1_1
370	salb_1_1
371	sea1_1_1
372	sep1_1_1
373	vick_1_1
374	yycH_1_1
375	yycI_1_1
376	yycJ_1_1
394	entA_entI_1_1
395	entD_1_1
396	entR_1_1
397	oep_1_1
398	sagA_1_2
432	cim_1_1
433	aldA_1_1
434	aldA_2_1
435	hemly_1_1
436	pSL017_1_1
437	pSL020_1_1
438	rcaA_1_1
439	rmlC_1_1
440	rmlD_1_1

SEQ ID NO	Probe
441	waaG_1_1
442	wbbD_1_1
443	wbbM_1_1
444	wbbN_1_1
445	wbdA_1_1
446	wbdC_1_1
447	wztKpn_1_1
448	yibD_1_1
491	aprA_1_1
492	aprE_1_1
493	ctx_1_2
494	algB_1_1
495	algN_1_1
496	algR_1_1
497	ExoS_1_1
498	fpvA_1_1
499	lasRa_1_1
500	lipA_1_1
501	lipH_1_1
502	Orf159_1_2
503	Orf252_1_1
504	pchG_1_1
505	PhzA_1_1
506	PhzB_1_1
507	PLC_1_1
508	plcN_1_1
509	plcR_1_1
510	pvdD_1_1
511	pvdF_1_2
512	pyocinS1_1_1
513	pyocinS1im_1_1
514	pyocinS2_1_1
515	pys2_1_1
516	pys2_2_1
517	rbf303_1_1
518	rhIA_1_1
519	rhIB_1_1
520	rhIR_1_1
521	TnAP41_1_2
522	toxA_1_1
592	igaStrpneu_1_1
593	lytA_1_1
594	nanA_1_1
595	nanBStrpneu_1_1
596	pcpCStrpneu_1_1
597	ply_1_1
598	prtAStrpneu_1_1
599	pspA_1_2
600	SP0834Strpneu_1_1
601	SP0834Strpneu_1_2
602	sphtraStrpneu_1_1
603	wciJStrpneu_1_1
604	wziyStrpneu_1_1

SEQ ID NO	Probe
605	wzxStrpneu_1_1
640	CAMPfactor_1_1
641	CAMPfactor_2_1
642	0499Straga_1_1
643	hylStragal_1_1
644	lipStragal_1_1
657	DNaseIStrpyog_1_1
658	fba2Strpyog_1_1
659	fhuAStrpyog_1_1
660	fhuB1Strpyog_1_1
661	fhuDStrpyog_1_1
662	fhuGStrpyog_1_1
663	hlyA_1_1
664	hlyP_1_1
665	hlyp2_1_1
666	oppB_1_1
667	ropB_1_1
668	scpAStrpyog_1_1
669	sloStrpyog_1_1
670	smez-4Strpyog_1_1
671	sof_1_1
672	sof_2_1
673	speA_1_1
674	speB2Strpyog_1_1
675	speCStrpyog_1_1
676	speJStrpyog_1_1
677	srtBStrpyog_1_1
678	srtCStrpyog_1_1
679	srtEStrpyog_1_1
680	srtFStrpyog_1_1
681	srtGStrpyog_1_1
682	srtIStrpyog_1_1
683	srtKStrpyog_1_1
684	srtRStrpyog_1_1
685	srtTStrpyog_1_1
686	vickKStrpyog_1_1
702	hlyXStrmut_1_1
703	igaStrmitis_1_1
704	igaStrsanguis_1_1
705	perMStrmut_1_1
750	flaA_1_1
751	flaD_1_1
752	fliA_1_1
753	hpmA_1_1
754	hpmB_1_1
755	lpsPrmi_1_1
756	mrpA_1_1
757	mrpB_1_1
758	mrpC_1_1
759	mrpD_1_1
760	mrpE_1_1
761	mrpF_1_1
762	mrpG_1_1

SEQ ID NO	Probe
763	mrpH_1_1
764	mrpI_1_1
765	mrpJ_1_1
766	patA_1_1
767	putA_1_1
768	uca_1_1
769	ureDPrmi_1_1
770	ureEPrmi_1_1
771	ureFPrmi_1_1
772	zapA_1_1
773	zapB_1_1
774	zapD_1_1
775	zapE_1_1
782	end_1_1
783	pqrA_1_1
784	urg_1_1
2905	sloStrep_1_1

c) resistance probes

SEQ ID NO	Probe
785	blaIMP-7_1_1
786	mecISepid_1_1
787	blaOXA-10_1_2
788	blaB_1_1
789	ampC_1_1
790	I-blaR_1_1
791	blaOXA-32_1_1
792	bla-CTX-M-22_1_1
793	pbp2aStrpneu_1_1
794	blaSHV-1_1_1
795	blaOXA-2_1_1
796	blaRShaemolyt_1_1
797	blaIMP-7_1_2
798	I-mecR_1_1
799	blaOXY_1_1
800	dacCStrpyog_1_1
801	femA_1_1
802	mecA_1_1
803	blaIShaemolyt_1_1
804	blavim_1_1
805	pbp2b_1_1
806	pbp2primeSepid_1_1
807	pbp2x_1_1
808	pbp3Saureuc_1_1
809	pbp4_1_1
810	pbp5Efaecium_1_1
811	pbpC_1_1
812	I-mecI_1_1
813	pbp1a_1_1
814	I-blaI_1_1
815	blaTEM-106_1_1

SEQ ID NO	Probe
816	blaOXY-KLOX_1_1
817	ftsWEF_1_1
818	fmhB_1_1
819	cumA_1_1
820	femBShaemolyt_1_1
821	blaPER-1_1_1
822	bla_FOX-3_1_1
823	blaA_1_1
824	psrb_1_1
825	fmhA_1_1
826	mecR1Sepid_1_1
827	blaZ_1_1
828	blaOXA-1_1_1
829	fox-6_1_1
830	blaPrmi_1_1
831	aacA_aphDStwar_1_1
832	aacC1_1_2
833	aacC2_1_1
834	strB_1_1
835	aadA_1_1
836	aadB_1_2
837	aadD_1_1
838	aacA4_1_2
839	strA_1_1
840	aph-A3_1_1
841	aacC1_1_1
842	aacA4_1_1
843	aacA-aphD_1_1
844	I-spc_1_1
845	aphA3_1_1
846	ermC_1_1
847	linB_1_1
848	satSA_1_1
849	mdrSA_1_1
850	I-linA_1_1
851	ermB_1_2
852	ermA_1_1
853	satA_1_1
854	msrA_1_1
855	mphBM_1_1
856	mefA_1_1
857	mrX_1_1
858	dfrStrpneu_1_1
859	dfrA_1_1
860	cmlA5_1_1
861	catEfaecium_1_1
862	cat_1_1
863	tetAJ_1_1
864	tetL_1_1
865	tetM_1_1
866	vanH(tn)_1_1
867	vanA_1_1
868	vanHB2_1_1

SEQ ID NO	Probe
869	vanR_1_1
870	vanRB2_1_1
871	vanS(tn)_1_1
872	vanSB2_1_1
873	vanWB2_1_1
874	ddl_1_1
875	ble_1_1
876	vanXB2_1_1
877	vanY(tn)_1_1
878	vanYB2_1_1
879	vanB_1_1
880	vanZ(tn)_1_1
881	vanC-2_1_1
882	vanX(tn)_1_1
883	acrB_1_1
884	mexB_1_2
885	I-qacA_1_1
886	sulI_1_1
887	sul_1_1
888	cadBStalugd_1_1
889	mexA_1_1
890	acrR_1_1
891	emeA_1_1
892	acrA_1_1
893	rtn_1_1
894	abcXStrpmut_1_1
895	qacEdelta1_1_1
896	elkT-abcA_1_1
897	I-cadA_1_1
898	albA_1_1
899	wzm_1_1
900	msrCb_1_1
901	nov_1_1
902	wzt_1_1
903	wbbl_1_1
904	norA23_1_1
905	mexR_1_1
906	arr2_1_1
907	mreA_1_1
908	I-cadC_1_1
909	uvrA_1_1
910	CRD2_1_1
911	CDR1_1_1
912	CDR1_2_1
913	MET3_1_1
914	FET3_1_1
915	FTR2_1_1
916	MDR1-7_1_1
917	ERG11_1_1
918	SEC20_1_1
2864	aacA4ENCL_1_1
2865	AdeR-ACIBA_1_1
2866	adeA-ACIBA_1_1

SEQ ID NO	Probe
2867	aac(6p)-lb7_1_1
2868	adeB-ACIBA_1_1
2869	adeC-ACIBA_1_1
2870	AdeS-ACIBA_1_1
2871	blaL2_1_1
2872	blaMIR-3_1_1
2873	ampR_1_1
2874	ampC-ENCL_1_1
2875	blaL1_1_1
2888	sulII_1_1
2907	tetA-ACIBA_1_1
2908	tetR-ACIBA_1_1

d) controls and utility

SEQ ID NO	Probe
919	rbcl_1_1
925	rbcl_1_2
920	LDHA(hu)_1_1
921	GAPD(hu)_1_1
922	b-Act(hu)_1_1
923	ARHGDIA(hu)_1_1
924	PGK1(hu)_1_1
926	16SPa_1_1
927	23SEfaecium_2_1
928	16SStrepyog_1_1
929	16SStrepneu_1_1
930	16SStrepagalactiae_1_1
931	16SEfaecium_1_1
932	16SEfaecium_2_1
933	16SRNAEf_2_1
934	16SKpn_1_1
935	16SSa_3_1
936	16SRNAEf_1_1
937	16SShominis_1_1
938	16SShaemolyt_1_1
939	23SEfaecium_1_1
940	16SrRNAPrmi_1_1
941	16SrRNAPrvu1_1_1
942	16SSa_1_1
943	16SKlox_1_1
944	p53_1_1
945	0135mihck_1_1
946	FAN_1_1
947	0270cap_1_1
2842	16SStrepdysgal_1_1

The DNA microarray of (1) is preferably suitable for

- 5 (I) identification of *Staphylococcus aureus* and comprises one or more or all gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71,

74, 76, 77, 79, 2902 and 2903, preferably at least one of the gene probes represented by SEQ ID NO:71, 68, 4 and 69; and/or

(II) identification of *Escherichia coli* and comprises one or more or all gene probes selected from SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170, preferably at least one of the gene probes represented by SEQ ID NO:145, 160, 161 and 170; and/or

(III) identification of *Staphylococcus epidermidis* and comprises gene probes selected from SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199, preferably at least one of the gene probes represented by SEQ ID NO:177, 178 and 190; and/or

(IV) identification of *Staphylococcus haemolyticus* and comprises one or more or all gene probes selected from SEQ ID NO:211, 213 and 214, preferably at least one of the gene probes represented by SEQ ID NO:211 and 214; and/or

(V) identification of *Staphylococcus lugdunensis* and comprises one or more or all gene probes selected from SEQ ID NO:216, 217 and 219-221, preferably at least one of the gene probes represented by SEQ ID NO:216, 219, 220 and 221; and/or

(VI) identification of *Staphylococcus warneri* and comprises one or more or all gene probes selected from SEQ ID NO:224-228 and 230 preferably at least one of the gene probes represented by SEQ ID NO:224, 226 and 230; and/or

(VII) identification of *Staphylococcus saprophyticus* and comprises one or more or all gene probes selected from SEQ ID NO:222 and 223; and/or

(VIII) identification of *Staphylococcus hominis* and comprises one or more or all gene probes selected from SEQ ID NO:2096, 194 and 229 (do hybridise with *S. hominis* DNA) and 211 and 214 (do not hybridise with *S. hominis* DNA); and/or

(IX) identification of *Candida albicans* and comprises one or more or all gene probes selected from SEQ ID NO:231-291, preferably at least one of the gene probes represented by SEQ ID NO:232 and 249; and/or

(X) identification of *Enterococcus faecalis* and comprises one or more or all gene probes selected from SEQ ID NO:308-310 and 312-342, preferably at least one of the gene probes represented by SEQ ID NO:308, 310 and 314; and/or

(XI) identification of *Enterococcus faecium* and comprises one or more or all gene probes selected from SEQ ID NO:377-393, preferably at least one of the gene probes represented by SEQ ID NO:380 and 385; and/or

(XII) identification of *Klebsiella pneumoniae* and comprises one or more or all gene probes selected from SEQ ID NO:399, 401-404, 408-415, 417, 420-423, 425 and 427-431, preferably at least one of the gene probes represented by SEQ ID NO:401, 410 and 430; and/or

5 (XIII) identification of *Klebsiella oxytoca* and comprises one or more or all gene probes selected from SEQ ID NO:459 and 466-469, preferably at least one of the gene probes represented by SEQ ID NO:459, 468 and 469; and/or

(XIV) identification of *Pseudomonas aeruginosa* and comprises one or more or all gene probes selected from SEQ ID NO:470-485, 487-493 and 505, preferably at
10 least one of the gene probes represented by SEQ ID NO:471, 474, 488 and 505; and/or

(XV) identification of *Streptococcus pneumoniae* and comprises one or more or all gene probes selected from SEQ ID NO:523-591, preferably at least one of the gene probes represented by SEQ ID NO:558 and 562; and/or

15 (XVI) identification of *Streptococcus agalactiae* and comprises one or more or all gene probes selected from SEQ ID NO:606-639, preferably at least one of the gene probes represented by SEQ ID NO: 606 and 619; and/or

(XVII) identification of *Streptococcus pyogenes* and comprises one or more or all gene probes selected from SEQ ID NO:645-648, 652, 655, 656, 658 and 660,
20 preferably at least one of the gene probes represented by SEQ ID NO:645, 658 and 660; and/or

(XVIII) identification of *Streptococcus mutans* and comprises one or more or all gene probes selected from SEQ ID NO:687-701, preferably at least one of the gene probes represented by SEQ ID NO:687, 691 and 692; and/or

25 (XIX) identification of *Proteus mirabilis* and comprises one or more or all gene probes selected from SEQ ID NO:706-710, 712-742 and 744-749, preferably at least one of the gene probes represented by SEQ ID NO:721, 725 and 735; and/or

(XX) identification of *Proteus vulgaris* and comprises one or more or all gene probes selected from SEQ ID NO:776-778 and 780-781, preferably at least one of the gene
30 probes represented by SEQ ID NO:776, 777 and 781; and/or

(XXI) identification of *Acinetobacter baumannii* and comprises one or more or all gene probes selected from SEQ ID NO:2843-2863, preferably at least one of the gene probes represented by SEQ ID NO:2858 and 2863.

In a preferred aspect of present invention, the DNA microarray of embodiment (1) is suitable for species specific identification of at least *S. aureus* and preferably comprises gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903, more preferably from SEQ ID NO:4, 68, 69 and 71, even more preferably comprises at least SEQ ID NO:71.

In a second preferred aspect, the DNA microarray is suitable for species specific identification of at least *S. aureus*, *E. coli*, CoNS, *Enterococcus* sp., and/or *Candida* sp., and preferably comprises gene probes selected from

a) SEQ ID NO:4, 68, 69 and 71, preferably SEQ ID NO: 71 for identification of *S. aureus*;

b) SEQ ID NO: 145, 160, 161 and 170, preferably SEQ ID NO:145 for identification of *E. coli*;

c) SEQ ID NO:177, 178 and 190, preferably SEQ ID NO:178 for identification of *S. epidermidis*;

d) SEQ ID NO:60, 61, 70, 72, 78 and 125, preferably SEQ ID NO:78 for identification of the genus *Staphylococci* including *S. aureus*;

e) SEQ ID NO:210, 224 and 2906, preferably 2906 for identification of CoNS;

f) SEQ ID NO:308, 310 and 314, preferably SEQ ID NO:310 for identification of *Enterococcus faecalis*;

g) SEQ ID NO:380 and 385, preferably SEQ ID NO:380 for identification of *Enterococcus faecium*;

h) SEQ ID NO:232 and 249, preferably SEQ ID NO:249 for identification of *Candida albicans*;

respectively. These microorganisms are the prevalent microorganisms in clinical samples and/or are of the highest diagnostic relevance. The probes listed under (a) to (h) are the most reliable probes for identification of said microorganisms.

From above second preferred aspect, there can be selected a set of probes which is even more preferred, namely SEQ ID NO:71, 2906, 145 and 249. A DNA microarray comprising one, several or all of said four probes is suitable for species specific detection or differentiation of

- (i) *S. aureus* if it comprises SEQ ID NO:71;
- (ii) CoNS if it comprises SEQ ID NO:2906;
- (iii) *E. coli* if it comprises SEQ ID NO:145; and/or
- (iv) *Candida albicans* if it comprises SEQ ID NO:249.

5 This set of four probes thus forms an especially preferred set of probes for embodiment (1).

There are some further sets of probes which are especially preferred for the DNA microarray of embodiment (1). Namely, there are a few DNA microarrays which form preferred aspects of embodiment (1). They are suitable for species-specific
10 identification and differentiation of the following sets of microorganisms and therefore comprise at least the minimum number of probes which are necessary for the species specific identification:

- (A) *S. aureus*;
- (B) Staphylococci including *S. aureus* and CoNS;
- 15 (C) set (A) or (B) additionally including *E. coli*;
- (D) any of the sets of (A) to (C) additionally including *C. albicans*;
- (E) any of the sets of (A) to (D) additionally including *Enterococcus* sp.;
- (F) any of the sets of (A) to (E) additionally including *Proteus* sp. and/or *P. aeruginosa*.
- 20 Sets (B), (C) and (D) are preferred, set (D) is especially preferred.

In addition, the DNA microarray of embodiment (1) may be suitable for additional species specific identification or differentiation of one or more of *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Proteus mirabilis* and *Proteus vulgaris*.

- 25 In a further especially preferred aspect, the DNA microarray of (1) is suitable for
- (I) virulence determination of *Staphylococcus aureus* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:100-141; and/or
 - (II) virulence determination of *Escherichia coli* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:153-173; and/or

(III) virulence determination of *Staphylococcus epidermidis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:200-208; and/or

(IV) virulence determination of *Staphylococcus haemolyticus* and comprises the gene probe of group (b) represented by SEQ ID NO:215; and/or

(V) virulence determination of *Staphylococcus lugdunensis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:220-221; and/or

(VI) virulence determination of *Staphylococcus warneri* and comprises the gene probe of group (b) represented by SEQ ID NO:230; and/or

(VII) virulence determination of *Candida albicans* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:292-307; and/or

(VIII) virulence determination of *Enterococcus faecalis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:343-376; and/or

(IX) virulence determination of *Enterococcus faecium* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:394-398; and/or

(X) virulence determination of *Klebsiella pneumonia* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:432-448; and/or

(XI) virulence determination of *Klebsiella oxytoca*; and/or

(XII) virulence determination of *Pseudomonas aeruginosa* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:491-522; and/or

(XIII) virulence determination of *Streptococcus pneumoniae* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:592-605; and/or

(XIV) virulence determination of *Streptococcus agalactiae* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:640-644; and/or

(XV) virulence determination of *Streptococcus pyogenes* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:657-686; and/or

(XVI) virulence determination of *Streptococcus mutans* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:702-705; and/or

(XVII) virulence determination of *Proteus mirabilis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:750-775; and/or

(XVIII) virulence determination of *Proteus vulgaris* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:782-784.

5 In a further especially preferred aspect, the DNA microarray of (1) is suitable for antibiotic resistance determination of (I) *Staphylococcus aureus*, (II) *Escherichia coli*, (III) *Staphylococcus epidermidis*, (IV) *Staphylococcus haemolyticus*, (V) *Staphylococcus lugdunensis*, (VI) *Staphylococcus warneri*, (VIII) *Enterococcus faecalis*, (IX) *Enterococcus faecium*, (X) *Klebsiella pneumonia*, (XI) *Klebsiella*
10 *oxytoca*, (XII) *Pseudomonas aeruginosa*, (XIII) *Streptococcus pneumoniae*, (XIV) *Streptococcus agalactiae*, (XV) *Streptococcus pyogenes*, (XVI) *Streptococcus viridans*, (XVII) *Proteus mirabilis*, and/or (XVIII) *Proteus vulgaris* and comprises one or more or all of the gene probes of group (c) selected from SEQ ID NO:785-909; 2864-2875, 2888, 2907-2908 and/or

15 it is suitable for antibiotic resistance determination of (VII) *Candida albicans* and comprises one or more or all of the gene probes of group (c) selected from SEQ ID NO:910-918.

In a preferred embodiment, the microarray of (1) is suitable for identification and characterisation, i.e. virulence and/or resistance determination, of the target
20 microorganism and comprises one or more or all of the gene probes of group (a) and additionally one or more or all of the gene probes of group (b) and group (c) for each organism as listed above.

If the identification and/or characterisation of *S. aureus*, *E. coli* and/or *P. aeruginosa* is the aim of a test using the array, then the array comprises preferably
25 at least the core gene probes designated in example 1.7, more preferably all the sequences listed in Tab. 2 and/or Tab. 6. Even more preferred, it consists of said sequences.

The gene probes were considered as most preferable if they were i) known previously to be species-specific, ii) bioinformatically selected to have the least
30 chance to hybridise with nontarget genes and iii) empirically proven to be specific in a series of experiments (see Examples).

In a most especially preferred aspect, the DNA microarray of (1) comprises the following gene probes, even more preferably consists of the following gene probes:

(I) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus aureus*, it comprises

(a) the gene probes represented by SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903; and at least one of

5 (b) the gene probes represented by SEQ ID NO:100-141 and

(c) the gene probes represented by SEQ ID NO:785-909, 2864-2875, 2888, 2907, 2908.

(II) When the DNA microarray is suitable for identification and characterisation of *Escherichia coli*, it comprises

10 (a) the gene probes represented by SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170; and at least one of

(b) the gene probes represented by SEQ ID NO:153-173 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875, 2888, 2907, 2908.

15 (III) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus epidermidis*, it comprises

(a) the gene probes represented by SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199; and at least one of

(b) the gene probes represented by SEQ ID NO: 200-208 and

20 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875, 2888, 2907, 2908.

(IV) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus haemolyticus*, it comprises

25 (a) the gene probes represented by SEQ ID NO:211, 213 and 214; and at least one of

(b) the gene probes represented by SEQ ID NO: 215 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

30 (V) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus lugdunensis*, it comprises

(a) the gene probes represented by SEQ ID NO:216, 217 and 219-221; and at least one of

(b) the gene probes represented by SEQ ID NO: 220-221 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(VI) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus warneri*, it comprises

5 (a) the gene probes represented by SEQ ID NO:224-228 and 230; and at least one of

(b) the gene probes represented by SEQ ID NO: 230 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

10 (VII) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus saprophyticus*, it comprises

(a) the gene probes represented by SEQ ID NO:222 and 223; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

15 (VIII) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus hominis*, it comprises

(a) the gene probes represented by SEQ ID NO:2096, 194, 229, 211 and 214; and at least one of

20 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(IX) When the DNA microarray is suitable for identification and characterisation of *Candida albicans*, it comprises

(a) the gene probes represented by SEQ ID NO:231-291; and at least one of

(b) the gene probes represented by SEQ ID NO: 292-307 and

25 (c) the gene probes represented by SEQ ID NO: 910-918, 2864-2875 2888, 2907, 2908.

(X) When the DNA microarray is suitable for identification and characterisation of *Enterococcus faecalis*, it comprises

30 (a) the gene probes represented by SEQ ID NO:308-310 and 312-342; and at least one of

(b) the gene probes represented by SEQ ID NO: 343-376 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XI) When the DNA microarray is suitable for identification and characterisation of *Enterococcus faecium*, it comprises

(a) the gene probes represented by SEQ ID NO:377-393; and at least one of

(b) the gene probes represented by SEQ ID NO: 394-398 and

5 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XII) When the DNA microarray is suitable for identification and characterisation of *Klebsiella pneumonia*, it comprises

10 (a) the gene probes represented by SEQ ID NO:399, 401-404, 408-415, 417, 420-423, 425 and 427-431; and at least one of

(b) the gene probes represented by SEQ ID NO: 432-448 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

15 (XIII) When the DNA microarray is suitable for identification and characterisation of *Klebsiella oxytoca*, it comprises

(a) the gene probes represented by SEQ ID NO:459 and 466-469; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

20 (XIV) When the DNA microarray is suitable for identification and characterisation of *Pseudomonas aeruginosa*, it comprises

(a) the gene probes represented by SEQ ID NO:470-485, 487-493 and 505; and at least one of

(b) the gene probes represented by SEQ ID NO: 491-522 and

25 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XV) When the DNA microarray is suitable for identification and characterisation of *Streptococcus pneumoniae*, it comprises

(a) the gene probes represented by SEQ ID NO:523-591; and at least one of

30 (b) the gene probes represented by SEQ ID NO: 592-605 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XVI) When the DNA microarray is suitable for identification and characterisation of *Streptococcus agalactiae*, it comprises

- (a) the gene probes represented by SEQ ID NO:606-639; and at least one of
- (b) the gene probes represented by SEQ ID NO: 640-644 and
- (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

5 (XVII) When the DNA microarray is suitable for identification and characterisation of *Streptococcus pyogenes*, it comprises

- (a) the gene probes represented by SEQ ID NO:645-648, 652, 655-656, 658 and 660; and at least one of
- (b) the gene probes represented by SEQ ID NO: 657-686 and
- 10 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XVIII) When the DNA microarray is suitable for identification and characterisation of *Streptococcus mutans*, it comprises

- (a) the gene probes represented by SEQ ID NO:687-701; and at least one of
- 15 (b) the gene probes represented by SEQ ID NO: 702-705 and
- (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XIX) When the DNA microarray is suitable for identification and characterisation of *Proteus mirabilis*, it comprises

- 20 (a) the gene probes represented by SEQ ID NO:706-710, 712-742 and 744-749; and at least one of
- (b) the gene probes represented by SEQ ID NO: 750-775 and
- (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

25 (XX) When the DNA microarray is suitable for identification and characterisation of *Proteus vulgaris*, it comprises

- (a) the gene probes represented by SEQ ID NO:776-778 and 780-781; and at least one of
- (b) the gene probes represented by SEQ ID NO: 782-784 and
- 30 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XXI) When the DNA microarray is suitable for identification and characterisation of *Acinetobacter baumannii*, it comprises

- (a) the gene probes represented by SEQ ID NO:2843-2863; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

The DNA microarray which is a preferred aspect of embodiment (1) can be fabricated using textbook methods for microarray production, including printing with fine-pointed pins onto the solid support, photolithography using pre-made masks or dynamic micromirror devices, ink-jet printing or electrochemistry on microelectrode arrays (Müller, H.-J., Röder, T., "Der Experimentator: Microarrays, Spektrum Akademischer Verlag, Heidelberg (2004)). Preferred fabrication methods are printing methods spotting the gene probes onto the solid surface of the microarray. The attachment of the spotted DNA to the surface is achieved by covalent or non-covalent binding, preferably by non-covalent binding, more preferably by electrostatic interaction (ionic binding), most preferably by ionic binding of the DNA to amino groups present on the surface of the solid support. Any amino-functionalized microarray support can be used, but gamma aminopropyl silane (GAPS™) coated slides, especially UltraGAPS™ coated glass slides, are preferred in present invention.

The amount of DNA per spot printed onto the array is from 0.1 to 15.0 ng, preferably from 0.1 to 0.2 ng.

Thus, the present invention also pertains to a method for fabrication of a microarray of embodiment (1), which method comprises spotting the gene probes listed above to an appropriate solid support.

The sample of embodiments (1) to (4) may be any sample containing microorganisms, including food samples, environmental samples and clinical specimens. A sample which is a clinical specimen is preferred. The sample or clinical specimen of embodiments (1) to (4) is preferably selected from the group consisting of whole blood, serum, urine, saliva, liquor, sputum, punktate, stool, pus, swabs, wound fluid and positive blood cultures, more preferably is whole blood or a positive blood culture, most preferably is a positive blood culture. If blood culture is used as DNA source, 0.5 ml positive blood culture is sufficient for identification and characterisation of the microorganisms and bacteria present without prior amplification of the target DNA.

Thus, the microarray of present application is

(i) a robust diagnostic tool, detecting all tested bacterial reference strains and clinical isolates;

(ii) sensitive enough to yield positive signals with e.g. only 20 ng of purified genomic *S. aureus* DNA or 2 µg of DNA extracted from blood culture which contains

5 a high percentage of human DNA;

(iii) highly specific, distinguishing e.g. *S. aureus* from distantly related gram-negative bacteria like *Escherichia coli* or *Pseudomonas aeruginosa* as well as from closely related CoNS;

10 (iv) precise enough to identify virulence factors and antibiotic resistance determinant genes without previous amplification by PCR.

Moreover, the whole procedure can be accomplished the same day after blood cultures become positive (e.g. in the Bactec®). Rapid identification of the causative pathogen in fungemia, bacteremia and sepsis is crucial for several reasons:

15 (i) appropriate antimicrobial therapy should be started as early as possible and unnecessary treatment avoided;

(ii) the prognosis of the patients with sepsis may be improved; and

(iii) expenditures on antimicrobials and prolonged hospitalisation can be reduced.

The DNA microarray of embodiment (1) is especially suitable for diagnosis of

20 (i) bacteremia, fungemia or sepsis, wherein the device preferably comprises probes for species specific identification of at least *S. aureus*, *E. coli*, CoNS, Enterococcus sp., and Candida sp.;

(ii) respiratory tract infections, wherein the device preferably comprises probes for species specific identification of at least Candida sp., *S. aureus* and *P. aeruginosa*; and/or

25 (iii) urinary tract infections, wherein the device preferably comprises probes for species specific identification of at least *E. coli*, Enterococci sp., Candida sp. and Proteus sp..

30 With the gene-segment based microarray of (1) there is an excellent correlation between genotypic detection of antibiotic resistance determinants and phenotypic typing using conventional susceptibility testing. In one aspect of the invention, the detection of the resistance genes *mecA*, *blaZ*, *ermA*, *ermC*, *msrSA*, *aadD* and *aacA-aphD* by microarray hybridisation allows for reliable prediction of oxacillin, penicillin, erythromycin, tobramycin and gentamicin resistance in a single assay.

By microarray hybridisation according to present invention it is furthermore possible to discriminate multi-resistant and multi-susceptible MRSA (strain MW2). Multi-susceptible MRSA have been shown to be susceptible to tobramycin and erythromycin (Polyzou, A. et al., J. Antimicrob. Chemother. 48:231-4 (2001);
5 Pournaras, S. et al., J. Clin. Microbiol. 39:779-81 (2001)).

In a preferred aspect of the invention, simultaneous comprehensive resistance genotyping for oxacillin, macrolide and aminoglycoside resistance genes (preferably *mecA*, *aadD*, *aacA-aphD*, *ermA,B,C* and *msrSA*) by microarray hybridisation allows the rapid discrimination of multi-resistant or multi-susceptible strains and in
10 consequence other therapeutic options with e.g. macrolides and may reduce reliance on vancomycin (Polyzou, A. et al., J. Antimicrob. Chemother. 48:231-4 (2001); Pournaras, S. et al., J. Clin. Microbiol. 39:779-81 (2001)).

One preferred aspect of embodiment (1) is a DNA microarray for the identification and characterisation of the three important bacteremia causing species
15 *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* in a sample, preferably in blood culture. The microarray allows simultaneous species identification and detection of important virulence and antibiotic resistance genes in a single assay. Preferably, this array consists of 2-20 species specific gene probes, 1-20 virulence gene probes and 1-20 resistance gene probes of at least 100 nt
20 length, more preferably of 200-800 nt length. One especially preferred embodiment is an array comprising or consisting of the gene probes listed in Tab. 2. The probes may be amplified from recombinant plasmids or synthesized by any other method known in the art. These probes represent genes encoding house-keeping proteins, virulence factors and antibiotic resistance determinants. Evaluation with 42 clinical
25 isolates, 3 reference strains and 13 positive blood cultures revealed that this DNA microarray is highly specific in identifying *S. aureus*, *E. coli* and *P. aeruginosa* strains and in discriminating them from closely related Gram-positive and Gram-negative bacterial strains also known to be etiological agents of bacteremia. In Example 1.6 and 1.7, this array was successful in identifying all tested 27 *E. coli*, *P.*
30 *aeruginosa* and *S. aureus* strains and in discriminating them from 21 closely related Gram positive and Gram negative bacterial strains. There is a nearly perfect correlation between genotypic antibiotic resistance by hybridisation to the *S. aureus* resistance gene probes *mecA* (oxacillin/methicillin resistance), *aacA-aphD*

(gentamicin resistance), *ermA* (erythromycin resistance) and *blaZ* (penicillin resistance) and the *E. coli* resistance gene probes *blaTEM-106* (penicillin resistance) and *aacC2* (aminoglycoside resistance) and phenotypic antibiotic resistance determined by conventional susceptibility testing (Example 1.10).

- 5 One further preferred aspect of embodiment (1) of the invention is a DNA microarray for the identification and characterisation of *S. aureus* in a sample, preferably in blood culture. Evaluation with 10 clinical isolates, 6 reference strains and 10 positive blood cultures revealed that this DNA microarray is highly specific in identifying *S. aureus* and in discriminating them from closely related Gram-
10 positive and Gram-negative bacterial strains also known to be etiological agents of bacteremia (Example 1.11).

The DNA microarray is - in the context of embodiment (2) - preferably used for *in vitro* differentiation of a plurality of different microbial strains contained in one sample and/or for species-specific identification of one or more microbial strain(s)
15 contained in a mixture of a plurality of microorganisms. The DNA microarray of embodiment (1) is advantageous for this kind of use, as it allows the simultaneous determination of the presence or absence in the analysed sample of all those microbial strains for which the device comprises species specific probes. The array is also suitable for identification and determination of single or of a selection of
20 microbial strains in a mixture of strains, especially in a clinical sample containing additional component, without prior isolation of the target strain. These advantages (simultaneous determination and applicability to clinical samples and mixtures) make the DNA microarray of embodiment (1) superior to conventional techniques of DNA amplification for identification of microbial strains like PCR.

- 25 The method of embodiment (3) comprises - after isolating the total DNA (including non-microbial DNA) from a sample - the steps of immediate labelling and microarray-based detection of this isolated DNA with or without, preferably without, further DNA amplification steps after the DNA isolation. It is one advantage of the method (3) that it can be performed without said further DNA amplification steps,
30 i.e. the isolated DNA is labelled and applied to the microarray without prior amplification. The use of a single protocol for all microbial species comprising all steps of a microarray procedure including DNA preparation and DNA-chip hybridisation, is essential for testing blood cultures or other clinical specimens,

where the bacterial diagnosis is usually uncertain. Preferably, a DNA preparation protocol employing sonication for simultaneous cell disruption and target DNA fragmentation is the method of choice to increase the sensitivity of the microarray, in particular towards low-copy number and/or plasmid encoded genes which may be underrepresented in the target DNA.

The method of embodiment (3) is preferably a method for diagnosis of bacteremia, fungemia or sepsis. Furthermore, the sample or clinical specimen used in embodiment (3) is preferably blood or derived from blood, more preferably is a blood culture. Most preferably, the clinical specimen is a positive blood culture.

To obtain positive signals in the method of embodiment (3), 100 pg of purified genomic microbial DNA may be sufficient (lower detection limit), but preferably at least 1 ng of said DNA should be present in the sample. Usually, at least 10 ng, preferably at least 20 ng, more preferably at least 1 µg of purified genomic microbial DNA or at least 1 µg, preferably at least 2 µg of DNA extracted from blood culture are required. 500 µl of positive blood culture yield enough DNA for several hybridisations.

In a preferred aspect of the method of embodiment (3), the DNA isolated in step (a) is labelled and applied to the analytical device without prior amplification, preferably is labelled by random priming. In a further preferred aspect, the DNA isolated in step (a) is fragmented before the labelling reaction. Both aspects simplify and speed up the analysis in comparison to convention methods.

In the method of embodiment (3), the ratio of microbial DNA to total DNA isolated from said sample or clinical specimen is less than or equal to 100 %, preferably is from 1% to 99%, more preferably from 30 to 60%.

The labelling reaction of the method of embodiment (3) may be any DNA labelling reaction known in the art. However, chemical labelling reactions consisting of chemical attachment of a reporter molecule to the sample DNA and labelling by integration of labelled nucleotides into the sample DNA are preferred. Preferably the reporter molecules are fluorophores, more preferably are of the cyanine group of fluorophores. Most preferably, the DNA is labelled with Cy3, Cy5 and/or Alexa Fluor 647 and Alexa Fluor 546. The ratio of bases to dye molecules (BDR) is preferably less or equal to 60.

The detection of the reporter molecule in the method of embodiment (3) of the invention is preferably done by using a suitable detection system for the bound reporter molecule. This detection system is preferably based on visualization of the reporter molecule, more preferably on fluorescence detection. Furthermore, the
5 detection is preferably done by a microarray scanner or microarray reader.

In the method of embodiment (3) of the invention, the DNA microarray can be substituted by any other solid support onto which DNA gene probes are attached in a way permitting hybridisation of the DNA in the sample and subsequent detection of the bound DNA. This includes the use of microtiter plates coated with one or
10 several DNA gene probes per well, of glass surfaces (like, e.g., microscopic slides) with DNA spots, of filter paper disks, membranes, gold electrodes and beads (particles with a diameter of from 1 nm to several μm made of glass, plastic, metal etc.) coated with DNA, etc.. The beads are preferably used in a multi-chamber system, more preferably in a microfluidic multi-chamber system, wherein each
15 chamber contains a population of beads. Each bead has an attached DNA sequence and the whole beads population in one chamber will carry the same DNA sequence, each chamber corresponding then to a specific capture probe. The target DNA to be analysed flows through the multi-chamber system and will hybridize with the complementary DNA sequences attached to the beads. Beads could be also
20 attached to a surface by magnetic force, i.e. paramagnetic beads coupled with DNA could be attached on the surface of the magnet and arrange in a lattice structure. Complimentary, beads made of a magnetic material could be attached to an iron surface.

The use of the DNA coated beads or of a DNA microarray of embodiment (1) is
25 preferred. The use of a DNA array is especially preferred.

Thus, in one preferred aspect, in the method of embodiment (3) the analytical device is a DNA microarray. In this case, the detection is preferably performed using a DNA microarray reader. In a second preferred aspect, the analytical device is a DNA coated bead or a set of DNA coated beads (plurality of DNA coated beads).
30 In this case, the application and/or detection step is preferably performed in a microfluidic device.

The kit of embodiment (4) of the invention may additionally comprise reagents for the labelling reactions of embodiment (3) and/or reagents necessary for the hybridisation step of the method of embodiment (3).

5 The present invention is described in more detail by reference to the following examples. It should be understood that these examples are for illustrative purpose only and are not to be construed as limiting the invention.

Examples

10 In the experimental examples described below, standard techniques of recombinant DNA technology were used that were described in various publications, e.g. Sambrook et al. (1989), Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, or Ausubel et al. (1987), Current Protocols in Molecular Biology 1987-1988, Wiley Interscience. Unless otherwise indicated, all enzymes and kits were used according to the manufacturers' specifications.

Example 1.1: Materials and Methods

15 Reference strains, clinical isolates and culture conditions: Bacterial reference strains were obtained from the American Type Culture Collection (ATCC, Manassas, Va.), the Deutsche Sammlung von Mikroorganismen und Zellkulturen (DSMZ, Braunschweig, Germany) or the network on antimicrobial resistance in *Staphylococcus aureus* (NARSA, Herndon, Virginia). Clinical isolates were obtained
20 from the inventors' clinical routine microbiology laboratory.

The following bacteria were used for evaluation of the specificity of the microarray in Examples 1.2-1.10: *Staphylococcus aureus* (ATCC 25923, NRS123 alias MW2, 5 clinical isolates), *Staphylococcus epidermidis* (5 clinical isolates), *Staphylococcus capitis* (clinical isolate), *Staphylococcus haemolyticus* (clinical isolate),
25 *Staphylococcus hominis* (clinical isolate), *Staphylococcus warneri* (clinical isolate), *Staphylococcus auricularis* (clinical isolate), *Micrococcus* spp. (clinical isolate), *Escherichia coli* (ATCC 25922, 6 clinical isolates), *Pseudomonas aeruginosa* (ATCC27853, 5 clinical isolates), *Klebsiella pneumoniae* (3 clinical isolates), *Proteus mirabilis* (2 clinical isolates), *Serratia marcescens* (2 clinical isolates), *Enterobacter cloacae* (clinical isolate),
30 *Enterobacter aerogenes* (clinical isolate), *Acinetobacter baumannii* (clinical isolate), *Stenotrophomonas maltophilia* (clinical isolate), *Enterococcus* spp. (clinical isolate), *Enterococcus faecalis* (clinical isolate) and

Streptococcus pneumoniae (clinical isolate). Bacterial strains and clinical isolates were grown over night at 37 °C with constant shaking in 5 ml Luria-Bertani (LB) broth or tryptic soy broth (TSB, 30 g/l, Merck) containing 3 g/l yeast extract. Enterococci and streptococci were grown in 10 ml TSB plus yeast without agitation under 5% CO₂. Overnight cultures were harvested at 2,560 g for 10 min. After discarding the supernatant the pellet was washed in 1 ml TE (10 mM Tris-HCl, pH 7.5 and 1 mM EDTA) and recovered by centrifugation at 17,900 g for 10 min. Cell pellets were used for DNA preparation.

Blood cultures: Aerobic and anaerobic blood culture bottles (BACTEC®, Becton Dickinson, Heidelberg, Germany) were inoculated with blood from patients with suspected sepsis and placed in a BACTEC® 9240 blood culture system (Becton Dickinson), a continuous-reading, automated, and computed blood culture system that detects the growth of microorganisms by monitoring CO₂ production. Incubation was performed according to the manufacturer's recommendations. Bottles with a positive growth index were removed from the incubator, and aliquots of 1 ml of the blood culture suspensions were taken aseptically with a needle syringe. 1 ml-aliquots of the blood culture suspensions were mixed with 1 ml 0.1% Triton®-X-100 and kept at room temperature for 5 min in order to disrupt human blood cells. Bacterial cells were then harvested at 17,900 g for 10 min, pellets were washed in 1 ml TE, recovered by centrifugation and used for DNA preparation. For conventional identification and susceptibility testing, a second 1 ml-aliquot was examined by Gram-stain and subcultured on agar plates. The organisms grown on agar plates were characterised and tested for susceptibility using a VITEK-2 system (bioMérieux, Inc., Nürtingen, Germany), Etest strips (AB BIODISK, Solna, Sweden) or disk diffusion tests following the method recommended by the National Committee for Clinical Laboratory Standards (NCCLS) (Standards, N.C.f.C.L., Approved standard M2-4a, Villanova, PA (1990)).

For microarray hybridisation experiments, DNA was prepared from 13 blood cultures positive for *S. aureus* (4), *S. epidermidis* (3), *S. pneumoniae* (2), *P. aeruginosa* (1), *E. coli* (2) and *P. mirabilis* (1).

Example 1.2: DNA preparation

Total cellular DNA was extracted and purified either by using the First-DNA All-tissue kit (GEN-IAL GmbH, Troisdorf, Germany) following the instructions of the

supplier or by enzymatic lysis followed by phenol/chloroform extraction. For the latter protocol, cell pellets were resuspended in 500 µl lysis buffer (20 mM Tris-HCl, pH 8.0, 2 mM EDTA, pH 8.0, and 1.2% Triton®-X-100) and lysozyme (Sigma, Taufkirchen, Germany) was added to reach a final concentration of 0.8 mg/ml. In addition, lysostaphin (Sigma) was added to a final concentration of 0.2 mg/ml to promote staphylococcal lysis or mutanolysin (0.5 U/µl; Sigma) was added to lyse Streptococci and Enterococci. After incubation at 37°C for one hour, cell lysates were treated with Proteinase K (1 mg/ml; Sigma) for 1 hour at 55°C and then with RNase A (0.2 mg/ml; Qiagen, Hilden, Germany) for 1 hour at 37°C. The volume was increased by the addition of 200 µl TE and the salt concentration was adjusted to 0.7 M by addition of 5 M NaCl. A 10% CTAB (cetyltrimethylammonium bromide) solution in 0.7 M NaCl was added to a final concentration of 1% and incubated at 65°C for 20 min in order to release DNA from polysaccharide DNA complexes. DNA was then extracted once with phenol/chloroform/isoamyl alcohol (25:24:1) and once with chloroform/isoamyl alcohol (24:1) prior to precipitation with one volume of isopropanol. After centrifugation at 17,900 g for 30 min, DNA pellets were washed in 70% ethanol and resuspended in 50-100 µl TE.

Concentration, purity and size of the purified DNA preparations were determined by UV-spectrophotometry (lambda 40, PerkinElmer, Boston USA) and 1% agarose gel electrophoresis.

Example 1.3: DNA labelling

Total DNA from commercially available reference strains, clinical isolates and blood cultures was labelled by a non-enzymatic chemical labelling method using the Label It Cy3/Cy5 kits (Mirus, Madison, USA) or the ULYSIS Alexa Fluor 467 Nucleic Acid Labelling Kit (Molecular Probes; Eugene, USA). Prior to labelling, each target DNA was spiked with three gene segments (1 µl each, 30 ng/µl) amplified by PCR from selected recombinant plasmids to serve as internal positive controls.

For labelling with the Label It Cy3/Cy5 kit 5 µg of high molecular weight DNA (>20 kb) were mixed with 7.5 µl reagent in a total volume of 50 µl and incubated for 2 hours at 37°C according to the recommendations by the supplier. After adjusting the volume to 200 µl with H₂O and adding 0.1 volume of 5 M NaCl, unbound label was removed by precipitation with 2 volumes of ice-cold absolute ethanol for at least 30 min at -20°C. The labelled DNA was recovered by centrifugation at 17,900

g for 30 min. The pellet was washed with 70% ethanol and resuspended in 70 µl TE.

For labelling with the Ulysis Alexa Fluor 647 kit, 1 µg DNA was denatured at 95°C for 5 min, cooled on ice, mixed with 20 µl labelling buffer and 5 µl reagent and incubated at 80°C for 15 min according to the instructions of the manufacturer. Unbound dye was removed by ethanol precipitation as described above. The relative labelling efficiency of a reaction was evaluated by calculating the approximate ratio of bases to dye molecules (acceptable labelling ratios for nucleic acid were ≤ 60). This ratio and the amount of recovered labelled DNA was determined by measuring the absorbance of the nucleic acids at 260 nm and the absorbance of the dye at its absorbance maximum using a lambda40 UV-spectrophotometer (PerkinElmer) and plastic disposable cuvettes for the range from 220 nm to 1,600 nm (UVette; Eppendorf, Hamburg, Germany).

Example 1.4: Microarray construction

Cloned PCR-products were used to generate probes for the DNA microarray. All together 120 gene segments representing virulence genes, antibiotic resistant determinants and species specific metabolic and structural genes from *S. aureus* (40), *E. coli* (31) and *P. aeruginosa* (49) were represented on the microarray (Tab. 2).

Tab. 2: Gene probes with SEQ ID NOs, function, gi numbers and primer sequences. *E. coli* gene probes (1-31), *P. aeruginosa* gene probes (32-80), *S. aureus* gene probes (81-120).

Ar-ray No.	Sym-bol	Function	gi number	gene probe SEQ ID NO	Primer forward [SEQ ID NO]	Primer reverse [SEQ ID NO]
1	<i>envZ</i>	Inner membrane osmosensor	453286	143	AGCCTGGTGACGA CTTATC [1233]	ATCCGCCAGTTGCTT AAC [1234]
2	<i>fes(2)</i>	Enterochelin esterase (siderophore)	145916	161	TGTTTCTGCACTCG AAATG [1269]	GGCAATAGCTTTCAC CAG [1270]
3	<i>fes(1)</i>	Enterochelin esterase (siderophore)	145916	160	TGTTTGAGGTCACT TTCTGG [1267]	CAATAGCTTTCACCA GGG [1268]

4	<i>nfrB</i>	Bacteriophage N4 receptor, inner membrane protein	16127994	145	ATGGAATTGCGTCT GTTC [1237]	AAGTTTAGCCACAGC AGG [1238]
5	<i>yachH</i>	Putative membrane protein	16127994	148	GACTCGGTACAGC GATTG [1242]	CTGACGTTGGGTATC TCG [1243]
6	<i>yagX</i>	Putative enzyme	16127994	149	CTTTACGACGGTTC TCCC [1244]	AATCTTCCCTGCTGA AATG [1245]
7	<i>ycdS</i>	Putative outer membrane protein	16127994	150	TTGAAACTTCTTAC TGCCG [1246]	AATTTCTAATGCAGC GTATTG [1247]
8	<i>b1169</i>		16127994	142	GTTTGGGACTTATT GCTCTG [1230]	CATCAGCCACAGTTT CAAG [1231]
9	<i>b1202</i>	Putative outer membrane protein	16127994	153	GAATACCAAAGCA GATCGTC [1252]	CCGAGATCGACAACA GAG [1253]
10	<i>fliCb</i>	Flagellar H antigen	8071787	144	ACCACGACAGGTC TTTATG [1234]	AGAGAGGGCACCGTC ACTAC [1235]
11	<i>iucA</i>	Aerobactin synthesis (siderophore)	474189	165	CATCAGGCAGTTAT CCTGTC [1276]	AGTCGTCCTCCTGCA TTAC [1277]
12	<i>iucB</i>	Aerobactin synthesis (siderophore)	474189	166	TTCACAGCGGATAT GGAC [1278]	CACTTTGCTCCCAGA AATAC [1279]
13	<i>iucC</i>	Aerobactin synthesis (siderophore)	474189	167	AGACTGGGATTTG GTCAAC [1280]	AGACACCATCCTGCC TTC [1281]
14	<i>papG</i>	Adhesin, P-pili protein	42307	168	GGAGTATATTGCGT GGGTAG [1282]	AAGATTCACCATAGA GGCG [1283]
15	<i>yciQ</i>	Putative membrane protein	16127994	151	ATAGCAGGGCTGT TTGTATC [1248]	GACACGGAAACCAA ATTAAC [1249]
16	<i>ymcA</i>	Hypothetical protein	16127994	152	TATTGTCATCGCGC AGAG [1250]	TGTTGGGTTGAAAGA GTAGC [1251]
17	<i>eae</i>	Genetic locus necessary for the production of attaching and effacing lesions on tissue culture, OM protein adhesin	145852	154	CTAACTCATTGTGG TGGAGC [1254]	CTTGTCATCGGTCAT GTTG [1255]
18	<i>eltB</i>	Enterotoxin subunit B	145830	155	GGCGTTACTATCCT CTCTATG [1256]	TTTCATACTGATTG CCG [1257]
19	<i>escR</i>	Secretion	2897961	156	TTTGTTGTTATTGG TACTTCATTC [1258]	ATCGAAATTGTTACT GGCG [1259]
20	<i>escT</i>	Secretion	2897961	157	TTACGCTTCCGATC ATAGTAG [1260]	GAATACGTTTAGTTG AGGCG [1261]
21	<i>escU</i>	Secretion	2897961	158	AAGTGAAGAGGTA ATGGCTG [1262]	TACCATCAGTATCCT TGGC [1263]

22	<i>espB</i>	Protein secreted by enteropathogenic <i>E. coli</i>	1657262	159	GATGGTGA CTCTAT TGCAGG [1264]	CCATACGATTCTGGA CCTC [1265]
23	<i>hlyA</i>	Enterohemorrhagic <i>Escherichia coli</i> hemolysin	525328	163	CTTGGAAATGTTGG TAAAGC [1272]	TAAACTCCTTCGGTT GAGC [1273]
24	<i>hlyB</i>	Enterohemorrhagic <i>Escherichia coli</i> hemolysin	1247757	164	TCAATGCTGAAACT ATAAGGC [1274]	ACTTAGCACCCAGTT CGAC [1275]
25	<i>SLTII</i>	Shiga-like toxin type II	304950	171	TTCTTCGGTATCCT ATTCCC [1288]	TGTGAGGTCCACTTC TTCC [1289]
26	<i>toxA-LTPA</i>	Subunit A of heat-labile enterotoxin	148027	172	AAATGGCGACAAAT TATACC [1290]	CTGGGTCTCCTCATT ACAAG [1291]
27	<i>VT2vaB</i>	Verotoxin-2 variant, beta-subunit, shiga-like toxin	148261	173	AAGAAGATGTTTAT GGCGG [1292]	GATTCACAGGTACTG GATTG [1293]
28	<i>aacC2</i>	aminoglycoside-(3)-N-acetyltransferase	45769	833	GACCGATCACCTA CGAG [2612]	CGAAATGCTTCTCAA GATAGG [2613]
29	<i>blaTEM-106</i>	Class A beta-lactamase	21464484	815	ACATCGAACTGGAT CTCAAC [2576]	TCTCAGCGATCTGTC TATTTC [2577]
30	<i>strB</i>	Streptomycin resistance protein B	17129524	834	AAGTTTCATTGCCA GACG [2614]	TAGACTGCGTTGCTC CTC [2615]
31	<i>sul</i>	Dihydropteroate synthase, sulfonamide resistance	17129524	887	CATCGTCAACATAA CCTCG [2720]	AATTCTTGCGGTTTC TTTC [2721]
32	<i>algB</i>	Alginate biosynthesis (exopolysaccharide)	150990	494	CACTTTCCGTTATT GCCTC [1934]	GAGGATGAGGATGT TGGC [1935]
33	<i>algN</i>	Alginate biosynthesis (exopolysaccharide)	150999	495	GACTGGCTGAATC GTCTC [1936]	GCAGGTCGTACCAG GAAG [1937]
34	<i>algR</i>	Alginate biosynthesis (exopolysaccharide)	151003	496	ATTGTCGATGACGA ACCTC [1938]	TTCAGGTAGAGCTG GAAATG [1939]
35	<i>aprA</i>	Alkaline protease	45279	491	CATTGAAAGGTCGT AGCG [1928]	CGACGAAGTGGATA TTGG [1929]
36	<i>aprE</i>	Alkaline protease secretion	45279	492	GGTCAAGCACATC CTAGTG [1930]	ACTTCCTTGCGGTAC TCC [1931]

37	<i>glpR</i>	Repression of glycerol metabolic enzymes (glp=glycerol-3-phosphate)	1399486	470	CAAGCACAACAAG AAATACG [1886]	TAGACCTCCGAAGA GTTGC [1887]
38	<i>lasRa</i>	Elastase, virulence protein	309873	499	CTGGGACGTTAGT GTCATC [1944]	GTCTTGGCATTGAGT TCG [1945]
39	<i>lasRb</i>	Transcriptional activator of elastase	151325	471	GAGCGACCTTGGA TTCTC [1888]	ATAAGACCCAAATTA ACGGC [1889]
40	<i>lipA</i>	Extracellular triacylglycerol lipase	45340	500	AAGAAGTCTCTGCT CCCC [1946]	ACGATTTCTCCACC TGT [1947]
41	<i>lipH</i>	Lipophilic protein necessary for the expression of active lipase	483463	501	ATGGCAGTTTCAGT GTCG [1948]	CGAAATAGTCGTCCA GCC [1949]
42	<i>mexA</i>	Multidrug resistance protein MexA precursor	5616092	889	CTCGACCCGATCTA CGTC [2724]	GTCTTCACCTCGACA CCC [2725]
43	<i>Orf25</i> 2	DnaJ-like protein	4545242	503	GACCTGCTGTTCCA GTTG [1952]	AATTCACGGGTTTTC TCG [1953]
44	<i>OrfX</i>	Regulatory protein, glycerol metabolism	1399486	472	ATGGATGCTCGGG TACTG [1890]	CTCAGCTACAGCCAC GAC [1891]
45	<i>pa026</i> 0	Hypothetical protein	15595198	473	GATCGTCTCTGCCC AGTC [1892]	ACATTGATGGTGTCG TCC [1893]
46	<i>pa057</i> 2	Hypothetical protein	15595198	474	AGGAGAGAACATG AGTCGC [1894]	TCCTTGTCCCAGTAG TTACC [1895]
47	<i>pa104</i> 6	Hypothetical protein	15595198	477	AGGCATCCATCGA GCTAC [1900]	AACGTCCGAGCAGG ATAC [1901]
48	<i>pa106</i> 9	Hypothetical protein	15595198	478	GCGAGGAGGTATT CGACA [1902]	CCCTTCTGCGAGTAG TGTT [1903]
49	<i>pa184</i> 6	Hypothetical protein	15595198	479	AAGGACTTCTGGTC GGTG [1904]	CAGGAACAGGTGCT CGTAG [1905]
50	<i>pa408</i> 2	Hypothetical protein	15595198	481	CGAGCACCAATATC GAAC [1908]	GAGCCGTAGGTGTT ATCG [1909]
51	<i>pchG</i>	Necessary for formation of siderophore pyochelin	4325021	504	CCTGCTCAACACCT TCTATC [1954]	GTCGAACAACGCGA ACAG [1955]
52	<i>PhzA</i>	Phenazine biosynthesis proteins (low molecular weight toxins)	5616088	505	GTTGAAAGGGTTTA CCGAC [1956]	AATTTCTGCATCGGG TTC [1957]

53	<i>PLC</i>	Phospholipase C (heat labile-hemolysin)	151492	507	GACTTCGCTGTTCG ACTTC [1960]	TCGGTTCGAGTTCAT AGC [1961]
54	<i>plcN</i>	Non-hemolytic phospholipase C	151497	508	GTGTTCCAGGTGTT CGAC [1962]	GATAGACGTTGTCCT TGACC [1963]
55	<i>plcR</i>	Phospholipase C regulation	151499	509	ACAACCTGGAACA GCAACT [1964]	CGACTCTTGCGCGTA TTC [1965]
56	<i>PstP</i>	Phosphoenolpyruvate-protein phosphotransferase	4545246	485	GAAGTGAAGTCCG CCAAG [1916]	TCGAGCATCATCAGG TAGAC [1917]
57	<i>purK</i>	AIR carboxylase II, purine biosynthesis	1621599	486	TCGAGAAGTCGAT GTTCAAG [1918]	CTTGCCGTAGTGATG CAG [1919]
58	<i>rhIA</i>	Rhamnosyl-transferase involved in rhamnolipid biosurfactant synthesis	452502	518	AGTCTGTTGGTATC GGTTTG [1982]	CTCCAGGTTCGAGGA AATG [1983]
59	<i>rhIR</i>	Rhamnolipid regulation	1117916	520	TTCGATTACTACGC CTATGG [1986]	GGTCCATTGCAGGAT CTC [1987]
60	<i>toxA</i>	Exotoxin A precursor	15595198	522	GTGCGCTACAGCT ACACG [1990]	CTTGCCTTCCCAGGT ATC [1991]
61	<i>uvrDII</i>	DNA helicase II UvrD	3249556	487	AGACCTACAACAAG GTTTCG [1920]	TGAGGATAGTCCCTT CGC [1921]
62	<i>vsmI</i>	Autoinducer synthesis protein	695153	488	ATTCCTCTCTGAAT CGCTG [1922]	AATATCTTCATCGCC AGTTG [1923]
63	<i>xcpX</i>	Secretion protein, translocation of exoproteins across outer membrane	45433	490	TTCAACCTCAACGG ACTG [1926]	TGCAAGGTAATCACC AGC [1927]
64	<i>ExoS</i>	Exoenzyme S, secreted toxin	13892017	497	CGTTTGGGACAGA TTGAG [1940]	GATACTCTGCTGACC TCGC [1941]
65	<i>fpvA</i>	Ferripyoverdine receptor	1633044	498	AATGCGATAACCAT CAGC [1942]	CCGTCGTAATGGAA GTTG [1943]
66	<i>pa0625</i>	Hypothetical protein	15595198	475	AGGAGCAACTGAA GCGAC [1896]	TCTGCCTTTACCCAG GAC [1897]
67	<i>pa0636</i>	Hypothetical protein	15595198	476	AAGGTTGGCAGGA TCAAC [1898]	CTAGTGGCGAAATTG AACAG [1899]
68	<i>pa3866</i>	Hypothetical protein	15595198	480	TTCCCTAACGAATG CTGTC [1906]	CGTTGCTCCCTCATA CAC [1907]
69	<i>PhzB</i>	Phenazine biosynthesis proteins (low molecular weight toxins)	5616088	506	ATGCTCGATAATGC TATTCC [1958]	TTCTCGTAGTAACCC TCGG [1959]

70	<i>pilAp</i>	Type IV pilin, involved in twitching motility and attachment	18535593	482	GCTTTACCTTGATC GAACTG [1910]	TCAATAGAGCCAGTC ACACC [1911]
71	<i>PilAp2</i>	type IV pilin, involved in twitching motility and attachment	21629637	483	TGCCGTGAGTGAA ATCAG [1912]	CGTAGTTGGCTTTCC AGTT [1913]
72	<i>pilC</i>	Pilin biogenesis protein	18535591	484	GGTATCAACCCACT AAAGGTC [1914]	GTCCAGAGCTTCTAC CAGAG [1915]
73	<i>pvdD</i>	Pyoverdine synthetase D (siderophore)	1633044	510	GTCAAGGGTGTTG TCTGC [1966]	CTCTGCACAACTCA GGG [1967]
74	<i>pyocin S1</i>	PyocinS1, bacteriocin	286179	512	CTTCAGTTCCGAGA TGCC [1970]	GTAACGAACGCTATC GGG [1971]
75	<i>pyocin S1im</i>	Immunity protein of pyocin S1	286179	513	ATATACGGAAAAAG AGTTTCTTGAG [1972]	AGCACGCCATTCTTT AACTTC [1973]
76	<i>pyocin S2</i>	PyocinS2	286182	514	TATACGGCTTCAGA CTTTCC [1974]	TGGCATAAGTATTGG CAG [1975]
77	<i>pys2(1)</i>	PyocinS2	15595198	515	TCGCCAATAAGAAG AAATTG [1976]	AGTGGTACTCGAAG GGTTCT [1977]
78	<i>pys2(2)</i>	PyocinS2	15595198	516	ATCCAGTATATTCC TGCTCG [1978]	TGCAATTTCTTCTTAT TGGC [1979]
79	<i>rbf303</i>	B-band LPS (O-antigen) biosynthesis	836903	517	ATCGTTCTGGTCTT CCTTG [1980]	ACCAAAGAGTGTTGA TAGCC [1981]
80	<i>rhIB</i>	Rhamnosyl-transferase involved in rhamnolipid biosurfactant synthesis	452502	519	AACGCTTTCTCGAT CAGG [1984]	GATACTGTGCGGTTG TGA [1985]
81	<i>femA</i>	Factor essential for methicillin resistance	4929298	801	TACAGTCATTTAC GCAAAC [2548]	TCACGCTCTTCATTT AGTTCT [2549]
82	<i>fmhA</i>	Factor essential for methicillin resistance	4574232	825	TGACTTCGGATGA GTTCAAT [2596]	GCTGTTAATTGTTGT TGCTTT [2597]
83	<i>fmhB</i>	Factor essential for methicillin resistance, putative	4574234	818	CTCACCCAAATGGA GATTTA [2582]	CTTGCTTTTCAGATG TTCC [2583]
84	<i>gyrA</i>	DNA gyrase subunit A	296393	60	AGGCTCGTATGATT GAAAAA [1066]	GGTTTTGAGCACGAT ATGTAG [1067]
85	<i>gyrB</i>	DNA gyrase subunit B	296393	61	TTGGCACAACATGAT AAGACA [1068]	AAAAATCGTTCAAAG TGCTC [1069]

86	<i>hemB</i>	Porphobilinogen synthase	2589180	62	ATCATCAGCGACAA TGAGAG [1070]	TTTTAACATCTCGA ACTATATCTAA [1071]
87	<i>hemN</i>	Oxygen-independent coproporphyrinogen oxidase	14349226	65	TCTTCCATTCTCTC AGTCAAA [1076]	AGACCATGTATGTAG GTGGC [1077]
88	<i>hla</i>	α -Hemolysin	46763	120	GTCAGCTCAGTAAC AACAAACAC [1186]	GTAGCGAAGTCTGG TGAAAA [1187]
89	<i>lip</i>	Lipase	393265	68	TGCATCTTCCATTT TAATAGC [1082]	GTCATTGTCCTTTGT TGGTT [1083]
90	<i>menC</i>	o-Succinylbenzoic acid synthetase	1255258	69	TTGACAGCTTTGCA TTTTTA [1084]	GGCTTTGTTGCTTTT AATGA [1085]
91	<i>NAG</i>	N-acetylglucosaminidase	2506026	125	AAGTTGCTCAAATA CAAGCTG [1196]	TGATGTTAGCCCAAT CTACA [1197]
92	<i>norA23</i>	Quinolone resistance protein	4115706	904	GGTTACTTGTTGCT GCTTTT [2754]	CGTAATCGCAATCGA AATA [2755]
93	<i>nuc</i>	Nuclease	46623	71	TGGCTATCAGTAAT GTTTCG [1088]	GAATCAGCGTTGTCT TCG [1089]
94	<i>rpoB</i>	RNA polymerase B-subunit	677848	73	TGGAAGACATCGT AAACGTA [1092]	TGGATCAAAGAAACG TGAAT [1093]
95	<i>tag</i>	DNA-3-methyladenine glycosidase	6434027	81	TTTTGATTTATCTTC TGACGG [1108]	CATTCATTTTATTCCC ACCT [1109]
96	<i>16SSa</i>	16S rRNA	46498	942	TCTCTGATGTTAGC GGCGG [2830]	TCAGGCTTTCGCCCA TT [2831]
97	<i>clfB</i>	Clumping factor B	3393010	4	TAGCATAGCAACAA ACAGTGA [954]	GTTTTGACCTGAAGC TGTATC [955]
98	<i>EDIN</i>	Epidermal cell differentiation inhibitor	152997	113	AAAGATAGTTCTAA GATAAATGGTC [1172]	GGCCATTATTGGTCT GTTG [1173]
99	<i>elkT-abcA</i>	Lantibiotic epilancin K7 tranlocator	1841513	896	ATTAGAAATTGCGA CTGGTG [2738]	AGCGTGTCATATCCT TCATC [2739]
100	<i>epiP-bsaP</i>	Biosynthesis of lantibiotic epidermin; serine protease	21204850	58	CTTAGATGTCCCAT GCTGAT [1062]	GTCAAACGAGTGCTA ATGGT [1063]
101	<i>geh</i>	Lipase precursor; glycerol ester hydrolase	153019	59	TTCAATAGGCGTG GTGTC [1064]	TTATCTGTCGGTTTC TCTGG [1065]
102	<i>mreA</i>	ABC transporter	7548683	907	TACGATGACACCA GTCTTTG [2760]	ATCGACAAAACGTAC AGGAT [2761]
103	<i>murC</i>	UDP-N-acetylmuramoyl-L-alanine synthetase	2642658	70	GTATTATTGCTTGG GGTGAT [1086]	GGATATTTCTTTCGT GCTGT [1087]

104	<i>sak</i>	Staphylokinase	47425	126	TGTTATTATTCTCA TTTTCTTCAAT [1198]	ATGCTCTGATAAATC TGGGA [1199]
105	<i>sea</i>	Enterotoxin A	153120	127	TTTTATTCATTGCC CTAACG [1200]	TTTTCAGAGTTAATC GTTTTATTATC [1201]
106	<i>sec1</i>	Enterotoxin C	46566	129	AATTTTTGGCACAT GATTTA [1204]	CTTTTATGTCTAGTT CTTGAGCTG [1205]
107	<i>etb</i>	Exfoliative toxine B precursor	153011	115	TTTAGCAGCGTCA ATTTTT [1176]	CTGATCCAGAGTTTC CTACCT [1177]
108	<i>seb</i>	Enterotoxin B	152999	128	CGTAGATGTGTTTG GAGCTA [1202]	CTTGAGCAGTCACCT TTTC [1203]
109	<i>sstC</i>	Iron transport protein	3724154	80	TGATATTGGAAGAT ATTAGCATAGA [1106]	TGACAATCGCTTTAT TCATTT [1107]
110	<i>tst</i>	Toxic shock syndrome toxin	18266750	138	TTTTTATCGTAAGC CCTTTG [1222]	CAATAACCACCCGTT TTATC [1223]
111	<i>aacA- aphD</i>	Bifunctional aminoglyco- side modifying enzyme	3676412	843	AGATTTGCCAGAAC ATGAAT [2632]	TGTTGCATTTAGTCT TTCCA [2633]
112	<i>aadD</i>	Aminoglyco- side acetyl transferase	21623792	837	GCTATTGGTGTTTA TGGCTC [2620]	CTGATTGCTTAACTG CTTCA [2621]
113	<i>aph- A3</i>	3'5'-amino- glycoside acetyl- transferase	1272325	840	GAGAATATCACCG GAATTGA [2626]	GCTCGACATACTGTT CTTCC [2627]
114	<i>blaZ</i>	β -lactamase	1575124	827	TGCTTTAGTTTTAA GTGCATGT [2600]	TCCTTCATTACACTC TTGGC [2601]
115	<i>cat</i>	Chlorampheni- col acetyl- transferase	46651	862	AGAAAATTGGGATA GAAAAGAA [2670]	CTGCAAGGCAACTG GTAT [2671]
116	<i>dfrA</i>	S1 dihydro- folate reductase	3676404	859	CAATTACCTTGGCA CTTACC [2664]	CCCTTTTCTACGCAC TAAAT [2665]
117	<i>ermA</i>	rRNA methylase	13785452	852	CCAGAAAAACCCTA AAGACA [2650]	AAAGAACACGATATT CACGG [2651]
118	<i>ermC</i>	Adenine methylase	4138444	846	ACACAGTCAAACT TTATTACTTCA [2638]	CAACAAGTTTATTTT CTGTAGTTT [2639]
119	<i>msrS A</i>	Macrolide antibiotic resistance	3892641	854	GACAGATTTTCGAT CCCTTA [2654]	CCTTTTGTGTTTGAT GCACT [2655]
120	<i>mecA</i>	Penicillin bin- ding protein 2'	13785452	802	AGTTGTAGTTGTGCG GGTTTG [2550]	TGAAGTCGCTTTTCC TAGAG [2551]

S. aureus, *E. coli* and *P. aeruginosa* genes were selected from the literature and databases, and compared by BLAST analysis to all other sequences available in the

NCBI database. Primers were designed to amplify gene segments of 200-810 bp length and devoid of apparent homology with genes of other bacterial species and *Homo sapiens*. Gene segments were amplified by using the puReTaq Ready-To-Go PCR beads (Amersham Biosciences, Freiburg, Germany) and cloned into the pDrive Cloning Vector (Qiagen, Hilden, Germany) according to the recommendations of the suppliers and transformed into competent *Escherichia coli* (XL-1-Blue) cells using the calcium chloride protocol (Sambrook, J., Russel D.W., Molecular Cloning: A Laboratory Manual. Cold Spring Harbor Laboratory Press, NY (2001)).

For quality control purposes, all gene probes were partially sequenced and verified (with the BigDye kit 1.1 and an 377 DNA sequencer; Applied Biosystems, Foster City, USA). All sequences obtained were identical or substantially identical (>90% sequence identity) to those obtained from the database.

For DNA-probe production 120 recombinant plasmids containing *S. aureus*, *E. coli* and *P. aeruginosa* gene segments were used for re-amplification. Amplicons were purified and spotted in 4 replicates per slide on UltraGAPS™ Coated Slides (gamma amino propyl silane coated slides, Corning, NY, USA). Approximately 1 nl DNA (with a concentration of about 0.1 to about 0.2 ng/nl) per spot was spotted onto the slide with a Biorobotics Microgrid Microarrayer (Genomic Solutions, Ann Arbor, MI, USA).

Example 1.5: Hybridisation and scanning

All experiments described represent dual co-hybridisations of two different target DNA samples labelled respectively with Cy3, Cy5 or Alexa647. After removal of unbound label, Cy3 and Cy5/Alexa647 labelled DNAs were pooled and mixed with 10 µg of Salmon Sperm DNA and 50 µg of poly-A-DNA. The mixture was frozen in liquid nitrogen and lyophilised in the dark. Prior to hybridisation the target DNA was reconstituted in 33 µl H₂O and 55 µl 2x hybridisation solution (Memorec Biotec GmbH, Cologne, Germany) and chemically denatured with 11 µl denaturation buffer D1 (Mirus) and neutralized with 11 µl buffer N1 (Mirus) according the instructions of the supplier. Hybridisation was automatically performed with a TECAN Hybridisation Station (HS400, TECAN, Salzburg, Austria). The arrays were prewashed at 60°C for 1 min with 0.2% SDS and 4x SSC and prehybridised in 120 µl denatured prehybridisation buffer (Memorec) for 30 min at 60°C at mild agitation. After injection of 110 µl labelled DNA, hybridisation was performed at 60°C for 18 hours at mild agitation. The arrays were washed at 50°C in primary

wash buffer (Memorec) - five cycles of 1 min wash time and 30 s soak time - and in secondary wash buffer (Memorec) - five cycles of 20 s wash time and 30 s soak time -, and finally dried at 30°C with N₂ (2.7 bar) for 3 min. Hybridised arrays were scanned with a Scan Array 5000 laser scanner (PerkinElmer). Laser light of wavelengths at 532 and 635 nm was used to excite Cy3 dye and Cy5/Alexa647 dye, respectively. Fluorescent images were analysed by the ImaGene software (BioDiscovery, El Segundo, CA, USA).

Example 1.6: Specificity

In order to allow the simultaneous and rapid identification of *S. aureus*, *E. coli* and *P. aeruginosa* grown in blood culture specimens from septicemic patients, a microarray comprising a set of 40 *S. aureus*, 31 *E. coli* and 49 *P. aeruginosa* gene probes of 200 to 810 bp length was developed (Tab. 2).

The specificity of the DNA-chip was validated firstly (compare Example 1.1) with 45 well characterised clinical isolates and reference strains of the three target species as well as other related bacteria and secondly (compare Example 1.2) with 13 blood cultures from sepsis patients.

In all assays, three PCR-amplified DNA-segments, which had been added to each DNA preparation as a positive control, hybridised with the corresponding probes, indicating that labelling and hybridisation had performed efficiently.

Hybridisation experiments with *S. aureus*, *E. coli* and *P. aeruginosa* target DNAs, respectively, revealed specific hybridisation with the species-specific gene probes (Fig. 1). There was no cross-hybridisation between the three species with the exception of the *S. aureus* 16S rRNA gene probe (16SSa, Fig. 1C), which hybridised also with *E. coli* and *P. aeruginosa* target DNA.

Identification of *E. coli*, *P. aeruginosa* and *S. aureus* reference strains, clinical isolates and blood cultures (BC) by microarray analysis corresponded by 100% with the conventional identification results (Fig. 1).

Example 1.7: Detection and discrimination

Example 1.7A: Detection and discrimination of *E. coli*

All DNA samples from 9 *E. coli* strains hybridised always with seven *E. coli* gene probes (*envZ*, *fes* (1) and (2), *nfrB*, *yach*, *yagX*, *ycdS*) (Fig. 1A, columns 19 to 27);

in the following these genes are designated as core genes. With 14 *E. coli* gene probes variable hybridisation was observed including the antibiotic resistance gene probes *bla-TEM106*, *sul*, *strB* and *aacC2*. Such a variable hybridisation profile is expected for antibiotic resistance genes since acquired resistance to antimicrobials is strain specific. For 11 *E. coli* virulence gene probes (*eae*, *eltB*, *escR*, *escT*, *escU*, *espB*, *hlyA*, *hlyB*, *SLTII*, *toxA-LTPA*, *VT2vaB*) no hybridisation signals were detected with any of the tested *E. coli* isolates and blood cultures. Since these virulence genes are known to be specific for particular *E. coli* pathotypes (Bekal, S. et al., J. Clin. Microbiol., 41:2113-25 (2003)), it was not surprising that they were not present in the tested strains. The *eae*, *esc* and *esp* genes for example are encoded on a chromosomal pathogenicity island, which is typical for enteropathogenic *E. coli* exhibiting the unique virulence mechanism known as attaching and effacing (AE) (Elliott, S.J. et al., Mol. Microbiol., 28:1-4 (1998)). The alpha-hemolysin (*hly*) operon is encoded on a large plasmid of enterohemorrhagic *E. coli* strains (Schmidt, H. et al., Infect. Immun. 63:1055-61 (1995)).

Example 1.7B: Detection and discrimination of *Pseudomonas aeruginosa*

DNA samples obtained from *P. aeruginosa* uniformly hybridised with 32 out of 49 *P. aeruginosa* specific gene segments including the *mexA* gene probe (core genes). Variable hybridisation was observed with 17 probes allowing for discrimination of individual *P. aeruginosa* isolates (Fig. 1B, columns 12 to 18).

Example 1.7C: Detection and discrimination of *S. aureus*

Hybridisation experiments performed with 11 *S. aureus* target DNAs revealed signals in all assays with 16 *S. aureus* gene segments (core genes) (Fig. 1C, columns 1 to 11). Variable hybridisation was observed with 14 *S. aureus* gene probes including the 6 antibiotic resistance gene segments *aadD*, *aacA-aphD*, *blaZ*, *dfrA*, *ermA* and *mecA* and the virulence genes *sak*, *sea*, *sec1* and *EDIN*. The gene probes *geh*, *mreA*, *clfB* and *elkT-abcA* hybridised with 8, 10 (*mreA* and *clfB*) and 6 target DNAs respectively. However, PCR amplification of the four genes was positive for all 11 *S. aureus* target DNAs (not shown) suggesting that the four genes were present in all strains investigated and that these gene probes did not allow reliable detection of the four genes in *S. aureus*.

No hybridisation was observed with 10 probes including the toxin genes *seb*, *tst* and *etb*. In contrast to the community-acquired, multi-susceptible MRSA strain

MW2 that hybridised to *mecA* and *blaZ* only, all six clinical MRSA strains showed the same multiresistant hybridisation pattern and their DNA hybridised to *ermA* (erythromycin resistance), *mecA* (oxacillin resistance) and the *aadD* gene (tobramycin resistance). As for the majority of multiresistant MRSA strains the *ermA* and *aadD* genes were shown to be located upstream and downstream, respectively, of the *mecA* gene in the *mec* chromosomal region (Chambers, H.F., Clin. Microbiol. Rev., 10:781-91 (1997); Polyzou, A. et al., J. Antimicrob. Chemother., 48:231-4 (2001)). Hybridisation to the core gene probes permitted the identification of *S. aureus*, while hybridisation to antibiotic resistance gene probes allowed for discrimination of strains.

Example 1.7D: Discrimination of *E. coli*, *P. aeruginosa* and *S. aureus* from related bacterial species

Co-hybridisation experiments performed with related bacterial species confirmed the high specificity of the DNA-chip (Fig. 1): For *S. epidermidis* and all other Coagulase-negative staphylococci, cross-hybridisation was observed only with the *S. aureus* 16S rRNA gene probe (16SSa, Fig. 1C) and several common staphylococcal antibiotic resistance determinants (*aadD*, *aacA-aphD*, *aph-A3*, *blaZ*, *cat*, *dfrA*, *ermA*, *ermC*, *mdrSA*, *mecA*) (Fig. 1C, columns 28 to 36). There was no cross-hybridisation with other metabolic or virulence genes of *S. aureus*.

The *Micrococcus* spp. isolate showed no hybridisation with the DNA-chip (column 53). Streptococci (column 56 to 58) and enterococci (columns 54 and 55) showed hybridisation with the staphylococcal 16S RNA gene probe and once with the staphylococcal *aph-A3* aminoglycoside resistance gene probe (*Enterococcus* spp.) (Fig. 1C). Out of 12 strains of seven Gram-negative species (columns 41 to 52), two hybridised with the *S. aureus* 16S rRNA gene probe (*Klebsiella pneumoniae* and *Proteus mirabilis*, Fig. 1C, columns 41 and 47) and one clinical isolate of *Proteus mirabilis* hybridised with the *E. coli* resistance genes *bla-TEM106* (β -lactam resistance), *sul* (sulfonamide resistance) and *strB* (streptomycin resistance) (Fig. 1A, column 42). *Serratia*, *Stenotrophomonas*, *Acinetobacter* and *Enterobacter* species showed no cross-hybridisation with any gene probe.

Example 1.8: Sensitivity

While the majority of *P. aeruginosa* probes allowed unambiguous identification, some probes showed variable hybridisation patterns when microarray hybridisation

was performed with different target DNA samples prepared from the same isolate (Tab. 3).

Tab. 3: Microarray hybridisation signals obtained with different target DNA preparations of *Pseudomonas aeruginosa* isolates.

	Isolate									
	C4242			C3853		C3045		C3755		
DNA amount [ng]	130 ^a	382 ^a	1350 ^b	510 ^a	>2400 ^b	550 ^a	2950 ^b	1180 ^b	>1600 ^b	
BDR ^c	22	75	48	29	30	90	41	139	40	
No. of hybridised gene probes ^d	38 (88%)	31 (72%)	43 (100%)	36 (88%)	41 (100%)	34 (89%)	38 (100%)	41 (95%)	43 (100%)	

^a Labelled with Alexa647

^b Labelled with Cy3 or Cy5

^c BDR: Base to dye ratio; number of nucleotides per one dye molecule

^d Number of signals obtained with *P. aeruginosa* capture probes (total 49) after hybridisation with different DNA preparations. The percentage of specific hybridisations is compared to the highest number of signals obtained for each isolate (100%).

Successful hybridisation with strong fluorescent signals depends on efficiency of DNA labelling (ratio of bases per one dye molecule) and amount of labelled DNA. For the different target DNA preparations of four clinical isolates, variable hybridisation was observed with 14 gene probes (*uvrDII*, *vsmI*, *pa1069*, *rhlR*, *rhlA*, *rhlB*, *1046*, *pyocinS*, *pyocinS1im*, *plcR*, *plcN*, *PHZb*, *rbf303* and *pIIAp2*). For example, for three different DNA preparations of isolate C4242, hybridisation to *Pseudomonas*-gene probes varied from 31 to 43 probes, respectively, depending on the labelling efficiency and amount of DNA (Tab. 3). The lowest number of signals was detected with 382 ng target DNA, that, however, showed a high base to dye ratio of 75. Overall, the results suggest that varying amounts of DNA and base to dye ratios influenced the hybridisation results of few gene probes. However, irrespective of the varying quality and quantity of the labelled target DNA, 35 of the 49 *P. aeruginosa* gene probes showed robust hybridisation results in all performed experiments.

Example 1.9: Detection and characterisation of pathogens in blood cultures

Although DNA prepared from blood cultures comprises a mixture of human and bacterial DNA, the resulting hybridisation signals obtained with DNA from 1 ml positive blood culture allowed a clear and unambiguous characterisation of *S. aureus*, *E. coli* and *P. aeruginosa* present in 13 tested blood specimens (Fig. 1). In accordance to the VITEK2 characterisation, positive BACTEC[®] cultures were identified by microarray hybridisation as multi-resistant MRSA (Fig. 1C, column 8), penicillin-resistant *S. aureus* (column 9 and 11), multi-susceptible *S. aureus* (column 10), *E. coli* (Fig. 1A, columns 26 and 27), *P. aeruginosa* (Fig. 1B, column 18), and discriminated from oxacillin resistant *Staphylococcus epidermidis* (columns 33-35), *Proteus mirabilis* (column 43) and *Streptococcus pneumoniae* (columns 57 and 58).

Example 1.10: Correlation between susceptibility testing and microarray hybridisation of selected antibiotic resistance genes

S. aureus: For 11 *Staphylococcus aureus* strains and blood cultures, susceptibility results determined by the VITEK2 system, Etest strips and disk diffusion tests were compared with the results of the microarray hybridisation assay for the simultaneous detection of antibiotic resistance genes (Tab. 4). The presence or absence of resistance genes as indicated by microarray hybridisation was confirmed by PCR with gene specific primers (results not shown).

Tab. 4: Correlation between phenotypic and genotypic antibiotic resistance for 11 *S. aureus* isolates and blood cultures.

a) Penicillin resistance ^a	Hybridisation with <i>mecA/blaZ</i>	
	No. pos.	No. neg.
10 (resistant)	10	0
1 (susceptible)	0	1
b) Oxacillin resistance	Hybridisation with <i>mecA</i>	
	No. pos.	No. neg.
7 (resistant)	7	0
4 (susceptible)	0	4
c) Erythromycin resistance	Hybridisation with <i>ermA</i> , <i>ermC</i> or <i>msrA</i>	

	No. pos.	No. neg.
6 (resistant)	6	0
5 (susceptible)	0	5
<hr/>		
d) Tobramycin resistance	Hybridisation with <i>aadD</i>	
	No. pos.	No. neg.
5 (resistant)	5	0
6 (susceptible)	0	6
<hr/>		
e) Gentamicin resistance	Hybridisation with <i>aacA-aphD</i>	
	No. pos.	No. neg.
0 (resistant)	0	0
11 (susceptible)	0	11
<hr/>		
f) Trimethoprim resistance	Hybridisation with <i>dfrA</i>	
	No. pos.	No. neg.
1 (resistant)	0	1 ^b
10 (susceptible)	0	10

^a Number of strains tested for resistance

^b *dfrA* gene detected by PCR

For the *S. aureus* strains there was a 100% correlation between phenotypic resistance to penicillin and hybridisation to the *mecA* and/or *blaZ* gene (both genes confer resistance to penicillin, Tab. 4a). Phenotypic resistance to oxacillin correlated 100% with the hybridisation of the *mecA* gene (Table 4b), between resistance to erythromycin and hybridisation to the erythromycin resistance genes *ermA*, *ermC* or *msrSA* (Tab. 4c) and between resistance to tobramycin and hybridisation to the *aadD* gene (Tab. 4d). Furthermore, they all showed 100% correlation between phenotypic susceptibility to gentamicin and no hybridisation to the resistance genes *aacA-aphD* (Tab. 4e). Notably the *dfrA* gene of the trimethoprim resistant strain MW2 (MIC of 1 µg/ml) was not detected by microarray hybridisation (Tab. 4f), whereas PCR amplification revealed the presence of the *dfrA* gene.

E. coli and other Gram negative bacteria: The prototype microarray harboured only

four *E. coli* and one *P. aeruginosa* resistance gene probes which do not yet allow a comprehensive prediction of antibiotic resistances. Nevertheless, hybridisation with the *E. coli* resistance gene probe *blaTEM106* was observed in one *P. mirabilis* and four *E. coli* strains and correlated with phenotypic ampicillin resistance for all five strains (Tab. 5).

Tab. 5: Correlation between ampicillin/penicillin resistance, gentamicin/tobramycin resistance and streptomycin resistance and hybridisation with the resistance gene probes *blaTEM-106*, *aacC2*, *aph-A3* and *strB*, respectively.

Species	Resistance phenotype ^a	Hybridisation with			
		<i>blaTEM-106</i> ^b	<i>aacC2</i> ^b	<i>aph-A3</i> ^c	<i>strB</i> ^b
<i>E. coli</i> ATCC 25922	susceptible	-	-	-	-
<i>E. coli</i> C4821	AMP, STR	+	-	-	+
<i>E. coli</i> F3437	AMP	+	-	-	-
<i>E. coli</i> C3941	AMP, STR	+	-	-	+
<i>E. coli</i> F1806 ^d	AMP, GEN, TOB, STR	+	+	+	+
<i>E. coli</i> C4547	AMPi	-	-	-	-
<i>E. coli</i> C4230	AMP	-	-	-	-
<i>E. coli</i> C3940	susceptible	-	-	-	-
<i>E. coli</i> F1642 ^d	STR	-	-	-	+
<i>P. mirabilis</i> C4024	AMP, STR	+	-	-	+
<i>P. mirabilis</i> C4403	susceptible	-	-	-	-
<i>P. mirabilis</i> F1738 ^d	susceptible	-	-	-	-

^a AMP, ampicillin; GEN, gentamicin; STR, streptomycin; TOB, tobramycin; i, intermediate

^b *E. coli* gene probes

^c *S. aureus* gene probes

^d Positive blood culture

One *E. coli* blood culture showed also resistance to tobramycin and gentamicin. This phenotypic resistance correlated with the hybridisation of the *aacC2* gene probe for aminoglycoside resistance and the *S. aureus aph-A3* probe for tobramycin/kanamycin resistance (Tab. 5). For one *P. mirabilis* and four *E. coli*

strains, phenotypic resistance to streptomycin correlated with hybridisation to the *strB* probe (Tab. 5).

All *P. aeruginosa* strains hybridised with the *mexA* gene probe (Fig. 1) and showed phenotypic resistance to tetracycline, trimethoprim/sulfamethoxazole, penicillins (ampicillin, mezlocillin) and cephalosporines (cefazolin, cefixime, cefuroxime). The *mexA-mexB-oprM* operon is a determinant for a three component efflux system responsible for intrinsic and acquired multiresistance in *P. aeruginosa* (β -lactams, fluoroquinolones, trimethoprim, sulphonamides, chloramphenicol and others) (Poole, K., Clin. Microbiol. Infect. 10:12-26 (2004)).

10 Example 1.11: Microarray for specific detection of *S. aureus*

A) Strains and Cultures

Reference strains and clinical isolates: The following bacteria were purchased from the American Type Culture Collection (ATCC, Manassas, Va.) or the Deutsche Sammlung für Mikroorganismen und Zellkulturen (DMSZ, Braunschweig, Germany) and were used for evaluation of the specificity of the microarray: *Staphylococcus aureus* (ATCC 29213), *Staphylococcus epidermidis* (ATCC 12228; ATCC 18610) *Staphylococcus saprophyticus* (ATCC 14953), *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 27853). Ten clinical MRSA (methicillin resistant *S. aureus*) isolates were obtained from the inventors' clinical routine microbiology laboratory.

Bacterial cultures: Bacterial strains and clinical isolates were plated either onto sheep blood or onto Mueller-Hinton agar from 50% glycerol stocks. One colony was then picked and transferred to 5 ml Luria-Bertani (LB) broth and cultured overnight at 37°C.

Blood cultures: Aerobic blood culture bottles (BACTEC® Plus aerobic, Becton Dickinson, Heidelberg, Germany) were inoculated with 100 CFU of *S. aureus* after adding 10 ml blood from healthy volunteers. A BACTEC® 9240 blood culture system (Becton Dickinson) - a continuous reading, automated, and computed system detecting the growth of microorganisms by monitoring CO₂ production - was used for incubation according to the manufacturer's recommendations. Bottles with a positive growth index were removed from the incubator, and an aliquot of 1 ml of the blood culture suspension was taken aseptically with a needle syringe. The

aliquot was equally divided, with one part for subculture on agar plates and CFU determination, and one part for DNA isolation.

Additionally, in order to test the microarray upon real conditions, samples were collected from ten clinical positive blood culture specimens cultivated under the same conditions as described above. Six of them were positive for different *S. aureus* strains and four for other bacterial species (*Staphylococcus epidermidis*, *Streptococcus mitis*, *E. coli* and *Klebsiella oxytoca*). Blood culture aliquots of 500 µl were used for DNA preparation.

B) Generation of the *S. aureus* specific microarray

About 140 gene segments of *S. aureus* genes, but also a few of CoNS (SEQ ID NO: 177,178,179), were selected from the literature and nucleotide databases in order to cover different functional categories (virulence factors, species-specific metabolic and structural features, antibiotic resistance determinants). Tab. 6 provides the complete list of selected genes with gene symbol, gene function and SEQ ID NO of the segments.

Tab. 6: Selected *S. aureus* genes, selected segments (SEQ ID NO) and primers used for segment amplification (SEQ ID NO)

Gene symbol	Functions	gene probe SEQ ID NO	Primer forward [SEQ ID NO]	Primer reverse [SEQ ID NO]
<i>atl</i>	autolysin	99	AGCTGAGACGACACA AGATCAAA [1144]	TTATATTGCGTTTCAAGA GCTGC [1145]
<i>aroA</i>	3-phosphoshikimate 1-carboxyvinyl- transferase	84	ACCTTCAATATTCGCA TCC [1114]	TATTCCGATTATTAGGCG TAG [1115]
<i>aroC</i>	Chorismatsynthase	83	ATGAGATACCTAACAT CAGGAGAATCA [1112]	GCTATTCTTCCATCTAATT TACGATCATA [1113]
<i>aroE</i>	Shikimate dehydrogenase	95	GTTATCAATTAATACA ACCCCTGAAGC [1136]	TGGAACATAATTCTCCTTC GATTGTTA [1137]
<i>aroF</i>	3-deoxy-D-arabino- heptulosonate-7- phosphate synthase	96	GTAGTTGAAAATATG CCTGTTGGTGT [1138]	ATTACACCATTAACGATA ATTGGCAT [1139]
<i>aroG</i>	Chorismat-Mutase	97	AGACTTATTATCTAAA CGTGGTGAAC TAGC [1140]	CAAATGATTTATTGCCGT CTCCTA [1141]
<i>asp23</i>	alkaline shock protein	98	AAAATTGCTGGTATC GCTGCA [1142]	GTCATTACATCATCAACTT GCATGTTA [1143]
<i>cata</i>	catalase	1	TAAATTGTTTAGATTA CAATCAGAGG [948]	TTCAAAGTTTTCGTATGTT TCA [949]

<i>clpC</i>	endopeptidase	7	AATGCTGCTAACCTG CGTGAT [960]	CACGTCTAACCGCTTTAC TGATTG [961]
<i>clpP</i>	endopeptidase	8	AAAGTAAAGAGTAGA CTAAGCTGTCTGCTC [962]	ACCTAATAAAATTCAAGC ATTGGGA [963]
<i>ctaA</i>	cytochrome biosynthesis	9	AAGAATTTAAAATGGT TAGGTGTCGTA [964]	ACGTAATCGTTTTGTTGC CAAATA [965]
<i>ctsR</i>	transcription repressor of class III stress genes homologue	10	AACGTCCCATGCCATT AATTTT [966]	TTGCGTTTCTATTTAGCTC AGACA [967]
<i>dltA</i>	D-alanine-D-alanyl carrier protein ligase	11	ACAGAGCAGCAAAAG CGTTAGTG [968]	GACCTTGAATGAACCATT GACCAT [969]
<i>dltB</i>	hypothetical membrane transporter	12	CATATGGTGATTTTAC ATTCTTCTTAATTG [970]	CCTAACCATGTACTTTGT AACACTTTCA [971]
<i>dltC</i>	D-alanyl carrier protein	13	AAATTTATTAGCAGAA GTAGCAGAAAATG [972]	CTGAACTCTTCTAATGCTT CAACGATT [973]
<i>dnaK</i>	Heat-shock-protein	14	TTTAGGCGAAAATATT GGTGAAGA [974]	TTTGTCGTCGTCTTTTACT TCGTT [975]
<i>elkT</i>	lantibiotic epilancin K7 translocator	15	GGTCTTATCGTTGCA GCTATCACTAT [976]	GAGCGTATCGCATAAATA ATCTTTTC [977]
<i>eno</i>	2-phosphoglycerate dehydrogenase	87	CGATGTTTCATCATTGG TACTGGTA [1120]	GGTGTTACTAAAGCAGTT GAAAACG [1121]
<i>glnA</i>	glutamine synthetase; belongs to the femC locus	17	TAGTCACCATGAAGTT GCCCC [980]	CCTCTTGAAGATGGTACA CGGAT [981]
<i>glnR</i>	glutamine synthetase repressor; belongs to the femC locus	18	CGAATGATGCAATCA GACGAAA [982]	CACCACGATTTATTGGCA AAGTT [983]
<i>grlA</i>	DNA topoisomerase IV subunit A	19	TTGAATCACCAAATTG AGGTTGT[984]	CAGTCGTTTCAGATTTGAA TTTCTTT [985]
<i>grlB</i>	gyrase-like protein beta subunit B	20	AAATCCATCGAGATG GTAATATATATCA [986]	AAACTTAAATACTTTCTG AATATTGATCAT [987]
<i>groEL</i>	stress response; heat shock protein	21	GTATGCAATTTGATCG TGGTTAT [988]	TGTTAATGCATCGCCTTC AAC[989]
<i>groES</i>	stress response; heat shock protein	22	ATGTATGTTAGCACTC TTTAATGTAAAGTG [990]	GTTTAGTTGTGTTTCATTT TCGTT [991]
<i>gyrA</i>	DNA gyrase subunit A	60	CATCATTAATTCGATT CCCTGAAT [1066]	TCATTTACTTCATCTGCAT CCTCTT [1067]
<i>gyrB</i>	DNA gyrase subunit B	61	TCAATTTGACTTAAAA GAAGTTGGC [1068]	AAGATTTGTGGCATATCC TGAGTTA [1069]
<i>hemA</i>	Glutamyl-transfer RNA reductase	23	TGTCATATTATCAACA TGTAATCGAACTG [992]	AATATCAGTAATTCCAGA ACCAAGAAGAT [993]
<i>hemB</i>	Porphobilinogene synthase	62	TTGATAGACATAGAA GATTGAGATCATCAG [1070]	ACTTGAGAAATTGCTGTT TTAACAAGTAG [1071]
<i>hemC</i>	Porphobilinogene deaminase	63	GTAAATTAGTCGTTG GCTCCAGAAG [1072]	GGGATAGTGGTGTATGTG TTTTAGAAATA [1073]

<i>hemD</i>	Uroporphyrinogene III synthase	64	TGTTGATAACATTGCT GTGATAGGAA [1074]	AATGCATCGATTTGTTGA TGTTCTA [1075]
<i>hemE</i>	Uroporphyrinogene decarboxylase	24	AAAATGATCAAAGGT GAAGAAACATC [994]	AATCCTCGACATTTAATG CACCTAC [995]
<i>hemH</i>	Ferrochelatase	25	AATGGGATTATTAGTT ATGGCTTATGG [996]	GTGGATATGGATCATTAT TCTTTTCG [997]
<i>hemL</i>	GSA-1-Aminotransferase	26	ATGAGATATACGAAAT CAGAAGAAGCA [998]	CTAATCTTAAAGTATCCAA TGTAGCTTCTGTA [999]
<i>hemN</i>	oxygen-independent coproporphyrinogen oxidase	65	ACAGAATCAACCTGT AGATGAGTACTTAGA T [1076]	TGATATTTCGTATAACGCA CACCATC [1077]
<i>hemY</i>	putative involved in a late step of protoheme IX synthesis	27	AAACAGCAAGATCCT AATATTGATGTAAC [1000]	CTCTACGTACAATCGATA CTAATTCATTATCT [1001]
<i>lepA</i>	GTP-binding protein	28	ATTAACAAAATTGATT TACCTGCTGC [1002]	CTATAACCAAACCTAAT GCTTGTGAC [1003]
<i>lrgA</i>	holin-like protein LrgA	29	AAAGACGCATCAAAA CCAGCA [1004]	GGCTAATGACACCTAAAG AGTTAACAAC [1005]
<i>lrgB</i>	holin-like protein LrgA	30	GATTAACCACTTAGCA CTAAACACACCT [1006]	AATGTTTAACAAGCACTT CACGCT [1007]
<i>lytM</i>	peptidoglycan hydrolase	31	CGACAAACACCCAAC AAGCA [1008]	TGGCTGTTATACGCTTGG TTGT [1009]
<i>menB</i>	naphthoate synthase	32	GTTATCGTATTAAGT GTGAAGGTGATT [1010]	ACATTTAGTACATTACCG CCACCTAC [1011]
<i>menC</i>	o-succinylbenzoic acid synthetase	69	TTTAAGTCACAAATTG TAACACCGAA [1084]	TTAATTTAATTCTGGTGC GCTTTGT [1085]
<i>menD</i>	2-Succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylase	33	CGTAAGGGAAGTAGT TATCAGTCCG [1012]	TTAGCTGTATACTCGAAA TCCAATCC [1013]
<i>menE</i>	O-succinylbenzoic acid-CoA ligase	34	ATGGACTTTTGGTTAT ATAAACAAGCAC [1014]	TATTTACAGCAATGTCACC CGTATTA [1015]
<i>menF</i>	Isochorismate-Synthase	35	ATTGATAATTACATC CAACACCTGC [1016]	TCACTATCTGGATCAGAA TCTTTAACAAT [1017]
<i>murC</i>	UDP-N-acetylmuramoyl-L-alanine synthetase	70	CTTGGGGTGATGATG AACATCTA [1086]	AAGTGTGTGGTTGAAATA CTGCAA [1087]
<i>mutL</i>	DNA mismatch repair protein	38	TCGTTTACATCATAAT AATCATCAGAC [1022]	ACACAGAGAATAACCAGG AGAAGA [1023]
<i>mutS</i>	DNA mismatch repair protein	39	TTGTAATTCACCTAAC TTCACCAATG [1024]	TCAAGTTGCGAAATTAGC TGA [1025]
<i>pbg</i>	porphobilinogen synthase	41	GGTGTTCCAAACTCA AAAGATGATATA [1028]	TTGACACCATAACTCATT TAGGAATATTG [1029]
<i>pdhB</i>	pyruvate dehydrogenase (lipoamide): subunit E1beta	43	TGACATTTCAAATCAA TCACATCG [1032]	TTGGTAACCAAACATTTTC AGCTT [1033]

<i>pdhC</i>	dihydrolipoamide acetyltransferase: subunit E2	44	CTGGAGATACTATTG AAGAAGACGATG [1034]	TTGCTTTTACAGTTCTGTT TTCATCTAC [1035]
<i>pdhD</i>	dihydrolipoamide dehydrogenase: subunit E3	72	CAGGTAAATTAGTTGT AGTTGGTGGAG [1090]	AGTGGTAAACCTGGAACG ATATCA [1091]
<i>rpoB</i>	RNA polymerase B-subunit	73	ATTGTTACGTGCATTA GGTTTCTCA [1092]	TTTCTACTGGCTCGTCTAT AACGC [1093]
<i>rsbU</i>	putative operon encoding alternate sigma factor	45	TAGTTATCGAGATTAT CAAAGATTGGTAGA [1036]	GTAATTGTGAGTGTCCAT AAGAATCCA [1037]
<i>rsbV</i>	putative operon encoding alternate sigma factor	46	TGAATCTTAATATAGA AACAACCACTCAAG [1038]	ACGATCTGACACACCTAA AATGTA [1039]
<i>rsbW</i>	putative operon encoding alternate sigma factor	47	TCTAAAGAAGATTTTA TCGAAATG [1040]	CCCACATTGTTATTTTCTT TGTAT [1041]
<i>sdrC</i>	serine-aspartate repeat protein multigene family	139	GAAAGTATTCTGTAG GTA CTGCTTC [1224]	CCTTTATCAATCGCAATG TC [1225]
<i>sdrD</i>	serine-aspartate repeat protein multigene family	140	CGGGCAAATAAATAA AGATG [1226]	AACTGAAGATAAGCCGTT TG [1227]
<i>sdrE</i>	serine-aspartate repeat protein multigene family	141	TCTGTCGCAGTTTTAT CAGTTGAAG [1228]	GCAAAACAAGATGATGCA ACG [1229]
<i>sgp</i>	G protein	48	TGAGATAGATGCAAT CATGTTTATGG [1042]	GAAATAGGTACAATCTCT GTAAAGTCCATATA [1043]
<i>sigB</i>	sigma factor B	78	GATGGTTCAACTGTTA CGCTATTA [1102]	CTCTGAAGTCGTGATACA TGCA [1103]
<i>sirR</i>	sit operon metal dependent repressor	49	AATATAATTGGGAAG AAGTACATCAAGAAG [1044]	ATATTAGCAAATCGGTCT TATCTCTCA [1045]
<i>sodA</i>	superoxide dismutase	50	TTGAATTACCAAAATT ACCATACG [1046]	CTCCCAGAATAATGAATG GTTTAAAT [1047]
<i>sodB</i>	superoxide dismutase	51	GCGCATTTTGAAAAG GCA [1048]	GGGATAGCACGTAAAAGT GGAA- [1049]
<i>srtA</i>	transpeptidase; sortase that anchors surface proteins to the cell wall	91	CTGGTCCTGGATATA CTGGTTCTTT [1128]	GATTAATGACAATCGCTG GTGTG [1129]
<i>sstA</i>	iron transport proteins	52	TTCGTTGTTTCATAGGT GCGAGT [1050]	CTTTGAACAGCACTCGTG CG [1051]
<i>sstB</i>	iron transport protein	53	TATTGCCTTATTTAGA TGTATTGCTTTT [1052]	TCGTAGCTTCAAACACAT TTTCAA [1053]
<i>sstC</i>	iron transport protein	54	AATCAAATGATATTGG AAGATATTAGCA [1054]	TATTCAGTATCTTGTGCTA TTGTCATTG [1055]
<i>sstD</i>	iron transport protein	55	CATGCGGTAACAATT CTGATAAAGA [1056]	AATTTTCGCTTTAGGTGC AGCT [1057]

<i>stpC</i>	Potential ABC transporter	92	TTAACAATAGAACATT TAACAAAGAAG [1130]	CTCGAAATTAAGAAAGTA ACACC [1131]
<i>tag</i>	DNA-3- methyladenine glycosidase	81	GCATTTGGTACTAAA GATCCAGTCTACT [1108]	AACGAAAATACTGTTACT GGACCTAAAA [1109]
<i>trx</i>	thioredoxin reductase	56	GCTGACTATGAAGGT AAAGCTGACA [1058]	CAGCTAAGTTTTCTTTTG GTTGGA [1059]
<i>tyrA</i>	prephenate dehydrogenase	82	ATTCATTTAGTCAGTG GTCATCCAAT [1110]	GCTGTCGAATCATTCTA AAATATACGT [1111]
<i>yhiN</i>	yhiN-protein	57	CAATTGGCTTTCGATT ATTGTTGTA [1060]	AACCAATGATCTAGTGTA AATGTTAAACCT [1061]
	Virulence Factors			
<i>clfA</i>	clumping factor A	3	GCTTCAGTGCTTGTA GGTACGTAA [952]	TTGATTCACTAATTCCTCC GCAT [953]
<i>clfB</i>	clumping factor B	4	TAATGATACATCTGAT ATTAGTGCAAACAC [954]	TTTAGCATCAGCAGCATT TACTACC [955]
<i>cna</i>	collagen adhesin	85	TCGAGGAATTAACAA AGGTC [1116]	ATCAGGTTTAGTTGGTGG TG [1117]
<i>coa</i>	staphylocoagulase	5	TGTTAGGGATACACA ACATAAACTGA [956]	GATTTTGTTTCAGATTAC CGTATTT [957]
<i>ebpS</i>	cell surface elastin binding protein	86	GAACCTAGCCATCAA GACAG [1118]	GCATTATTAGAGGCATGT GG [1119]
<i>EDIN</i>	Epidermal cell differentiation inhibitor	113	TATCTTTAGCATTAAAG CGTTTATTCAAT [1172]	TTTCTAACTAGATTTTCAT CATACTGGC [1173]
<i>eta</i>	exfoliative toxine A precursor	114	TGCATTTAATTTACCA AAAGAGCTT [1174]	TGGATAGCCTATTAATTC GAGTTTG [1175]
<i>etb</i>	exfoliative toxine B precursor	115	AAGAGCTTTATACACA CATTACGGATAA [1176]	CAAAATATTGAGAATCAT TGAACATTTC [1177]
<i>fbpA</i>	fibrinogen binding protein	88	CTCTTTTACCTTTGA CGTTGGATT [1122]	GCCAAAATAGTGCTTCAA TATCAGA [1123]
<i>fib</i>	fibrinogen binding protein	89	GCTTTTCTGTGTGCAC TGACAGT [1124]	AGCGAAGGATACGGTCC AAG [1125]
<i>fnbA</i>	fibronectin-binding protein	93	TTACATCTGTACCCGT TTCCACTT [1132]	AAACTGCACAACCAGCAA ATATAGA [1133]
<i>fnbB</i>	fibronectin-binding protein	90	CCGCCTTAATTCCTTC TCCAAA [1126]	GCGAGTTGATTGCCATC GG [1127]
<i>geh</i>	lipase precursor; glycerol ester hydrolase	59	GAACAAGGGAATGCG ATAACG [1064]	AGGTGCAGTTTTATCATT AGACGG [1065]
<i>hla</i>	alpha-hemolysin	120	ATGATGAAAATGAAA ACACGTATAGTC [1186]	ATTTGAGCTACTTCATTAT CAGGTAGTTG [1187]
<i>hlb</i>	beta-hemolysin	121	TGTTAATAAAGGCACT CCAGAGTTC [1188]	CTTTGATTGGGTAATGAT CTGAAAA [1189]
<i>hld</i>	delta-hemolysin	110	TTTTATCTTAATTAAG GAAGGAGTGATTTC [1166]	TAGTGAATTTGTTCACTG TGTCGATAA [1167]

<i>hlgA_C</i>	gamma-hemolysin component A; C-terminus	117	ACTGAAGTAGAAAGT CAGAACTCTAAAGGT [1180]	GTGTTTTCCAGTTCACCTTC ATATTTAACT [1181]
<i>hlgA_N</i>	gamma-hemolysin component A; N-terminus	116	CTTAAAATTAAATAGA AAGAAAGT [1178]	ATGTTTTGAGTTATAGCT AATCGTT [1179]
<i>hlgB</i>	gamma-hemolysin component B	118	ATAGCTTCCACCCAAC ATATGGTAA [1182]	ATTTCACTTTGTGATTTTC CCAATC [1183]
<i>hlgC_C</i>	gamma-hemolysin component C; C-terminus	119	AATCAGCATTTGATAG CGATTTATTT [1184]	CCAATTGACTTCATATTTTC ACAGTGTA [1185]
<i>hysA</i>	hyaluronate lyase	111	AAACATCAAATCGCT GTGGCT [1168]	GTGAAAGATGCCCTTGAG TGG [1169]
<i>IgGbg</i>	IgG-binding protein	112	GGGTTCTTGCTGTCTT TAAGTGATT [1170]	TATATCTCGAAGTTGCTA GTTGGGG [1171]
<i>lip</i>	lipase; glycerol ester hydrolase	68	TTTTAAGTGGTGGAC AAGCACAA [1082]	GATTGTTATTAGCGTTTG AATCTTGAC [1083]
<i>lukF</i>	leucocidin F	122	CATATGGCAGAGATA GTTATCATTTCAACT [1190]	GATGTATGAGTTGCTCTT ATGTGATCTTTA [1191]
<i>lukS_C</i>	leucocidin S; C-terminus	124	AGTGTTCAATGGGGA ATAAAAGCTA [1194]	GATCCTTCTAAATAACTAT TGCCATAGTG [1195]
<i>lukS_N</i>	leucocidin S; C-terminus	123	AACATTGTCGTTAGG AATAATCACT [1192]	AATCAAAGCATCTTTGTTA TACTTT [1193]
<i>NAG</i>	N-acetyl-glucosaminidase; cytotoxin	125	ACTCAAACAGTTAGC AAGATTGCTC [1196]	TGCATTTACCCAACCAGT GC [1197]
<i>nuc</i>	nuclease	71	GCGATTGATGGTGAT ACGGTT [1088]	TTTTCGCTTGTGCTTCACT TTT [1089]
<i>sak</i>	staphylokinase	126	CGAGTTATTTTGAACC AACAGGC [1198]	GCGCAAAGATCGAAGTCA CTTAT [1199]
<i>sea</i>	staphylococcal enterotoxin A precursor	127	CTGATGTTTTTGATGG GAAGGTT [1200]	TGCATGTTTTTCAGAGTTA ATCGTTT [1201]
<i>seb</i>	staphylococcal enterotoxin B precursor	128	ATATATTCTATTAAGG ACACTAAGTTAGGGA AT [1202]	AGTTAGGTAATCTAATTCT TGAGCAGTCA [1203]
<i>sec</i>	staphylococcal enterotoxin C precursor	129	GGCACATGATTTAATT TATAACATTAGTG [1204]	ATTCCTAGCTTTTATGTCT AGTTCTTGAG [1205]
<i>spa</i>	immunoglobulin G binding protein A precursor	94	GGTATTGCATCTGTAA CTTTAGG [1134]	AGGTTAGCACTTTGACTT GG [1135]
<i>sprV8</i>	V8 serine protease gene	137	ACAAACGCAGTCAAG CAAACA [1220]	CATTGTTGCTGGTTTAAC TACTTCAC [1221]
<i>tst</i>	toxic shock syndrom toxin	138	AAAATTACCTACTCCA ATAGAACTACCTTT [1222]	TTTCTGCTTCTATAGTTTT TATTCATCA [1223]
	Antibiotic Resistance Determinants			
<i>aacA-aphD</i>	bifunctional aminoglycoside modifying enzyme	843	ACCCTCATAAAAATAA TCCAAGAGC [2632]	CTTTTTCTTTTGCATAACC TTTTTTC [2633]

<i>aadD</i>	aminoglycoside acetyl transferase; kanamycin resistance	837	AAGCAGAGTTCAGCC ATGAATG [2620]	CAGATGCGATGATGCAGACC [2621]
<i>aphA3</i>	3' 5'-aminoglycoside acetyltransferase; kanamycin resistance	845	CTGGTGGGAGAAAAT GAAAACC [2636]	CCAGTTTTTCGCAATCCAC ATC [2637]
<i>blaI</i>	regulator protein	814	AGCAAGTTGAAATAT CTATGGCTGA [2574]	TCATTTAAAATGTCTCGCA ATTCTT [2575]
<i>blaR</i>	beta lactamase repressor	790	GAAAATTCACGTATGT CATGGAATC [2526]	GCATTTTTCCCAGATGGC TT [2527]
<i>blaZ</i>	beta-lactamase	827	GATAAGAGATTTGCC TATGCTTCAA [2600]	TGCTTAATTTTCCATTGCG AT [2601]
<i>cadA</i>	Probable cadmium-transporting ATPase (Cadmium efflux ATPase)	897	TTGGATAGTTCAACAA AAACATTAACA [2740]	CATTTTTATCTTCTGTTAC CACTGGTT [2741]
<i>cadC</i>	Cadmium efflux system accessory protein homolog	908	TAGCAACCTCCCTTTG ATAC [2762]	ACAAAAGATATGTGTGAA GTTACC [2763]
<i>cat</i>	chloramphenicol acetyltransferase	862	CCTTCTTTGATTTATG CAATTATGG [2670]	GAAGCATGGTAACCATCA CATACA [2671]
<i>dfrA</i>	S1 dihydrofolate reductase; trimethoprim resistance	859	ATGACATTATCAATAA TTGTCGCTCA [2664]	AACATGACCAGATAACTC TTTAATTTTCAT [2665]
<i>ermA</i>	rRNA methylase	852	TAGCTATCTTATCGTT GAGAAGGGAT [2650]	AAAGAAATTGTTCTTCG ATAGTTTATT [2651]
<i>ermB</i>	adenine methylase	851	AACCGATACCGTTTAC GAAATTG [2648]	CGCTTGTAAGAATCCTTCT TCAACA [2649]
<i>ermC</i>	adenine methylase	846	AACACAGTCAAACTT TATTACTTCAAAAC [2638]	TTGCATAATTTATGGTCTA TTTCAATG [2639]
<i>femA</i>	factor essential for methicillin resistance	801	TAGGATTTGAACATAC TGGATTCCA [2548]	AAAGGCACTAACACACGG TCTTT [2549]
<i>femD</i>	putative factor essential for methicillin resistance	16	TCAGGTGAAATGTTA GAATCAGCA [978]	TAAGTCACCAAATAAGAA TGGCG [979]
<i>fmhA</i>	similar to Staphylococcus aureus FemA and FemB proteins	825	GTTAACGATTGATGA AACGCAA [2596]	TGCACCATCTTGTTCAATT TGTT [2597]
<i>fmhB</i>	essential for addition of glycine 1 to peptidoglycan precursor	818	GAGTTATTAAATAGTT TTGAACGCCG [2582]	TTCAGGATGTTCTTTTCT AAAGCT [2583]
<i>linA</i>	lincosaminide nucleotidyltransferase	850	GATATAGGATACAAA ATAGAAGTTGATTGG [2646]	GGTCTTTTTCTGTTAATTC ATAACCG [2647]

<i>mecA</i>	penicillin binding protein 2'	802	ATATGAGATAGGCAT CGTTCCAAA [2550]	CTAATAGATGTGAAGTCG CTTTTCCT [2551]
<i>mecI</i>	mecI protein	812	TAATAAAACGTATGAA ATATCATCTGCA [2570]	TTTCATCTTGATAGATC TTCTTTTTC [2571]
<i>mecR</i>	mecI protein	798	TTTAAAGAATGGAAC CAAGATCAAA [2542]	TCGCCTTTTAAATGTGTA GCAAA [2543]
<i>mreA</i>	ABC transporter	907	GCAGTATTAGTACTTG ATGAACCAACG [2760]	GACAAAACGTACAGGATG TCCATAA [2761]
<i>mreB</i>	ABC transporter	36	ATGAGGTACTCTTTAA TTAGTGGTATCTTGA [1018]	ATCAGCTAATGAAATGAA GATTGCA [1019]
<i>mreR</i>	ABC transporter	37	GAAAATACAGAACTT GATGGTGAAATG [1020]	GCAAGACTCACATACACC ATAAACTTC [1021]
<i>msrA</i>	methionine sulfoxide reductase	854	TCATAAGCTGACAGA TTTTCGATCC [2654]	CTTTTAGATGAACCTACA AATCACTTGG [2655]
<i>norA</i>	quinolone resistance protein	904	TTAGCTTTCATAATGT CAGTTGTATTGA [2754]	ACAGTGTTTCAAATGCCG ATAAA [2755]
<i>pbpF</i>	penicillin-binding protein Pbp2b	42	AACACAATCGGAAAT GTTGGATAC [1030]	CTATCCCAATCCATAGAC GTGTAA [1031]
<i>qacA</i>	quaternary ammonium compound resistance protein	885	CAATGGTTACAGGTT GTGGAAGA [2716]	GCCCACTACAGATTCTTC AGCTAC [2717]
<i>spc</i>	adenyltransferase AAD9	844	ATATCAGGAAAGATT GGAAATACGG [2634]	AAAGAGGTATAGCCCAT CTGCA [2635]

In order to obtain a high specificity level, each selected gene was compared to all other gene sequences available in the NCBI database using the BLAST algorithm. From that comparison, regions (ranging from 104 to 1434 bp) devoid of apparent

5 homology with genes of other bacterial species and *Homo sapiens* were defined and amplified by PCR using specifically designed primers (see Tab. 6). A mixture of the total DNA from three different *S. aureus* reference strains and 100 clinical isolates was used as template for amplification of *S. aureus* gene segments, increasing therefore the chances to amplify more seldom occurring virulence and antibiotic

10 resistance genes. PCR products were cloned into the plasmid pCR 2.1-Topo Vector (Invitrogen, Karlsruhe, Germany) which were used to transform competent *Escherichia coli* (XL-1-Blue) cells using the Calcium Chloride protocol (Seidman, C.E. et al., in: Ausubel, F.M. (ed.), Current Protocols in Molecular Biology, John Wiley & Sons, Inc. (2000)). Recombinant plasmids containing selected gene

15 segments were screened by restriction analysis and verified by sequencing. The plasmid library constructed was used for re-amplification and production of the bulk DNA (10 µg at a concentration of 1 µM) from each clone necessary for printing the

microchips. A Microgrid II spotter (BioRobotics, Cambridge, UK) and CMT-GAPS™ coated glass slides (Corning Incorporated, Corning, USA) were used. The complete array of 140 segments of genes was spotted in 3 replicates per slide.

C) DNA purification

5 a) Sample preparation

Bacterial cultures: Overnight cultures (5 ml) were harvested at 2,560g for 10 minutes. After discarding the supernatant the pellet was washed in 1ml TE (10 mM Tris-HCl, pH 7.5 - 1 mM EDTA) and recovered by centrifugation at 17,900 g for 2 min.

- 10 Blood cultures: One ml of blood culture was mixed with 1 ml 0.1% Triton®-X-100 and kept at room temperature for 5 min in order to disrupt blood human cells and resolve bacterial clumps. Bacterial cells were then harvested at 17,900 g for 10 min. Pellets were washed in 1 ml TE and recovered as described above.

b) Purification of DNA

- 15 Pellets of harvested cells were resuspended in 500 µl lysis buffer (20 mM Tris-HCl, pH 8.0 - 2 mM EDTA, pH 8.0 - 1.2% Triton®-X-100). To promote bacterial lysis, lysozyme and lysostaphin (Sigma, Taufkirchen, Germany) were added to reach a final concentration of 0.8 mg/ml and 0.2 mg/ml respectively. To lyse Gram negative bacterial cells, only lysozyme in the indicated concentration was used.
- 20 Samples were then incubated for one hour at 37°C. After treatment with Proteinase K (1 mg/ml) (Sigma, Taufkirchen, Germany) for 5 hours at 55°C under mild agitation, the samples were heated at 65°C for 30 min to inactivate Proteinase K and then cooled down to 37°C. Finally, a RNase A treatment (0.2 mg/ml) was carried out for 1 hour at 37°C. A pre-treatment with CTAB
- 25 (Cethyltrimethylammonium bromide) was performed in order to release DNA from polysaccharide DNA complexes (Murray, M.G. and Thopson, W.F., Nucl. Acid Res. 8:4321-4325 (1980)). Salt concentration was adjusted to 0.7 M by adding 5 M NaCl. After thoroughly mixing, a 10% CTAB-0.7M NaCl solution was added to adjust the CTAB concentration to 1%.

The mixture was subsequently incubated under rotation for 20 min at 65°C and then extracted with one volume of chloroform/isoamyl alcohol (24:1). The samples were spun in a microcentrifuge (17,900 g) at room temperature. The aqueous phase was extracted once with chloroform/isoamyl alcohol (24:1), once with
5 phenol/chloroform/isoamyl alcohol (25:24:1) and finally with chloroform/isoamyl alcohol (25:24:1). Genomic DNA in the aqueous phase was sonified (3 x 10 s at 12% amplitude with 20 s breaks between pulses) in a Digital Sonifier (Branson, Schwaebisch Gmuend, Germany) to obtain fragments of around 1 kb, then precipitated with one volume of isopropanol and pelleted by centrifugation for 30
10 min at 4°C in a microcentrifuge at 17,900 g. The pellets were washed in 70% ethanol and resuspended in 50-100 µl TE (10 mM Tris-HCl, pH 7.5 - 1 mM EDTA). This DNA preparation was used when a high yield (hundreds of µg) was necessary, for example to prepare samples for several hybridisations experiments.

A second protocol using DNeasy Tissue Kit (QIAGEN, Hilden, Germany) adapted to
15 bacterial cells and allowing DNA preparation in two hours, was also used when fast preparation was the priority. The abbreviations below pertain to the manufacturer's abbreviations for buffers used in the kit. The bacterial pellet was resuspended in 1 ml ddH₂O and the cell suspension frozen in liquid N₂ for 1 minute and then placed in a 60° C thermo-block for 2 minutes. Such a treatment was repeated once and
20 bacteria were centrifuged again for 5 minutes at 14,000g. The resulting pellet was resuspended in 180 µl lysis buffer (20 mM Tris-HCl, pH 8.0 - 2 mM EDTA, pH 8.0 - 1.2% Triton-X-100). Specifically for *S. aureus* DNA preparation, lysostaphin (0.2mg/ml) was added and incubated 1 hour at 37°C. After, 200 µl of buffer AL (for gram positive bacteria) or buffer ATL (for gram negative) and 25 µl of the
25 Proteinase K solution delivered with the kit were added and incubated at 70°C for 30 minutes. 200 µl of 100% ethanol were added and the suspension transferred to a DNeasy Mini Column placed into a collection tube. The column was centrifuged at 6,000 g for 1 minute, washed first with 500 µl of buffer AW1, centrifuged at 6,000 g for 1 minute, washed then with 500 µl of buffer AW2, and centrifuged at 14,000 g
30 for 3 minutes. The column was then placed in a 1.5 ml tube and centrifuged once more at 14,000 g for 1 minute. DNA was eluted with 130 µl of buffer AE. After one minute the column was centrifuged at 6,000g for 1 minute. The eluate was re-

loaded in the column and centrifuged again under the same conditions in order to increase the DNA yield.

D) DNA labelling

Different amounts of DNA (5 ng to 5 µg) were labelled with 3 µl either of Cy5-dCTP or Cy3-dCTP (Amersham Pharmacia Biotech Europe, Freiburg, Germany) by random priming (1 x random primer/Klenow reaction buffer) using Klenow Polymerase (50units) (both from BioPrime DNA labelling Kit, Invitrogen, Karlsruhe, Germany) in the presence of 0.12 mM dATP's, dGTP's and dTTP's and 0.06 mM dCTP's, in a total volume of 50 µl. After 2 hours incubation at 37°C, the reaction was interrupted by adding 5 µl of 0.5 M EDTA and the probe purified either by MiniElute PCR or QIAquick Purification Kits (QIAGEN, Hilden, Germany), depending on the amount of labelled DNA applying two wash and two elution steps.

E) Hybridisation and detection procedure

All experiments described in the present example represent co-hybridisation of two different DNA samples labelled respectively with Cy3 and Cy5. Cy3 and Cy5 belong to the cyanine family of fluorophores and were used as reporter molecules. The photochemical properties of the two CyDye fluors were as follows: Absorption maximum at 550 nm and emission maximum at 570 nm for Cy3 and for Cy5 at 649 nm and 670 nm, respectively.

After purification, Cy3 and Cy5 labelled DNA were pooled and 10 µg of Salmon Sperm DNA and 50 µg of polyA DNA were added. The mixture was frozen in liquid nitrogen and lyophilized in the dark. DNA microchips were automatically hybridised in a GeneTac Hybridisation Station (Genomic Solutions, Harvard, USA) following the Corning protocol.

Shortly, 110 µl of pre-hybridisation buffer (25% Formamide, 5x SSC, 0.1% SDS, 10 mg/ml BSA) were added to each slide and incubated for one hour at 42°C. Lyophilized samples were resuspended in 110µl of hybridisation buffer (25% Formamide, 5x SSC, 0.1% SDS), denatured for 3 minutes at 90°C, added to the slides, and incubated 4 hours at 42°C. After several washing steps using successively 2 x SSC/0.1% SDS, 0.1 x SSC/0.1% SDS, and 0.1 x SSC, slides were

dried by a 2 min centrifugation step (1000 g) and read in a Scan Array 5000 (Perkin Elmer, Boston, USA) using emission filters for Cy3 and Cy5 in two separate channels. Fluorescence intensities as hybridisation indicators were then analyzed by the software ImaGene (BioBiscovery, Marina Del Rey, USA). Spots were found and segmented in order to select areas of recognizable signals for analysis. Intensity of fluorescence of each spot was measured, signal to local background ratios were calculated, spot morphology and deviation from expected spot position were considered. Cut off values for those parameters were empirically determined in pilot experiments and used to tag spots either as positive or as negative.

10 F) Validation of the detection system

The experimental approach adopted in present example required dual-dye hybridisations. It was therefore necessary to verify at first whether DNA samples from the same source, labelled with one or the other fluorochrome, would produce the same hybridisation pattern. Co-hybridisation experiments, combining two identical samples of 2 µg of *S. aureus* DNA, produced strictly similar hybridisation results whatever fluorochrome was used for labelling (Fig. 2A). For better presentation gray scale images from scanning were converted in false-colour, where green and red colour represent intensity of Cy3 and Cy5 fluorochromes respectively. All spots showed double-hybridisation - yellow colour meaning the overlay between green (here assigned to Cy3 labelled DNA) and red signals (Cy5 labelled DNA). Signal intensities from both channels strongly correlated ($r^2=0,97$) (Fig. 2B).

G) Sensitivity of detection

S. aureus DNA samples in decreasing amounts (from 2 µg to 5 ng) were labelled and hybridised in order to determine the minimum amount of DNA producing the expected hybridisation pattern for a certain strain. Such expected patterns were defined as those produced by the hybridisation of 2 µg of DNA. From 2 µg to 50 ng no significant differences in the hybridisation pattern were observed with no false negative spots. Detection of 20 ng DNA was still satisfying with only 5% of false negative and false positive. However, 5 ng of labelled DNA yielded weak signals with almost 95% of false negative spots (data not shown). The limit of sensitivity of the *S. aureus* microarray was then considered as being 20 ng DNA which

corresponds approximately to 7×10^6 *S. aureus* CFU (*S. aureus* genome 2.5×10^6 bp. 2.8 fg DNA per cell).

H) Specificity of detection

5 The specificity of the *S. aureus* microchip was demonstrated by six independently performed co-hybridisation experiments. Visual examination of pictures showing results of co-hybridisation of *S. aureus* DNA with *Pseudomonas aeruginosa* or *Escherichia coli* DNA revealed no cross-hybridisation between *S. aureus* selected gene segments and DNA probes from those Gram negative bacteria (data not shown). Transcribing these data in a bar code showing positive or negative spots
10 (Fig. 3A and B) confirmed that only the *S. aureus* DNA sample hybridised with spotted probes.

The specificity of the microarray could be demonstrated even below the genus level. As shown in Fig. 4, some spotted *S. aureus* probes cross-hybridised with *S. epidermidis* and *S. saprophyticus* DNA samples. This is not surprising as these
15 species are phylogenetically closely related. However, genes coding for *S. aureus* specific proteins as nuclease (*nuc*), clumping factors A and B (*clfA* and *B*), protein A (*spa*), V8 serine protease (*sprV8*) and alpha and beta hemolysins (*hla* and *hlb*) exclusively hybridised with *S. aureus* DNA. The presence/absence of such genes allowed unambiguous discrimination between *S. aureus* and CoNS.

20 I) *S. aureus* strain profiling

The principle of the *S. aureus* microarray was tested as a tool for strain profiling. A distinctive hybridisation pattern could be established for reference strains and
10 selected clinical isolates. For instance when DNA from clinical isolates T100 and T103 were labelled with Cy5 and Cy3, respectively, and co-hybridised, both isolates
25 were identified as *S. aureus*, since both contained species-specific genes as e.g. clumping factor A and B (Fig. 5A).

Moreover, both strains are methicillin resistant (*mecA* positive), but only T100 contained the beta-lactamase gene. The hybridisation of T103 DNA reveals the presence of *ermA*, *ermB* and *aacA* genes indicating that the strain is resistant to
30 erythromycin and aminoglycosides.

Apparently, T103 harbors the genes encoding enterotoxines A (*eta*) and B (*etb*) while in T100 the gene encoding enterotoxin C (*etc*) is present. The presence or absence of these genes was confirmed by PCR assays (Fig. 5B) and the antibiotic resistance was verified by classical antibiograms (Sahm, D. & Washington, J. A. (1991). Antibacterial susceptibility tests: dilution methods. In: Manual of Clinical Microbiology (Balows, A., Ed.), pp. 1105–16. American Society for Microbiology, Washington DC, USA) (data not shown).

J) Detection of *S. aureus* in spiked positive BACTEC® cultures

One possible application of the *S. aureus* microarray is to detect the bacterium growing in blood culture, i.e. after the BACTEC® signals bacterial growth. Blood culture bottles were spiked with 100 CFU of *S. aureus*. After the automated culturing system indicated bacterial growth, 1 ml was withdrawn for DNA extraction.

As shown in Fig. 6A, DNA samples prepared from sterile blood culture show no crosshybridisation with spotted *S. aureus* probes. A 2 µg DNA sample derived from blood culture containing *S. aureus* cells revealed a hybridisation pattern almost completely identical to a DNA sample isolated from an overnight LB culture inoculated with a *S. aureus* colony (Fig. 6B).

These data underscore the high sensitivity and specificity of the detection system since blood culture DNA comprises a mixture of human and bacterial DNA. Co-hybridisation between DNA from blood culture positive for *S. aureus* and CoNS DNA also allowed clear identification since only the *S. aureus* probe hybridised to *S. aureus* species-specific genes (data not shown).

K) Detection of *S. aureus* in positive BACTEC® cultures inoculated with clinical specimens

Co-hybridisation with DNA from clinical blood cultures positive for *S. aureus* and CoNS (*Staphylococcus epidermidis*), *Streptococcus mitis*, *E. coli* and *Klebsiella oxytoca* allowed clear species identification since the *S. aureus* probes hybridised to *S. aureus* species-specific genes only. *Staphylococcus epidermidis* positive blood culture DNA hybridised to staphylococcal metabolic genes and to some antibiotic

resistance determinant genes only. No cross-hybridisation was detected between DNA from the two gram-negative strains and the *Streptococcus* strain and *S. aureus* spotted gene probes (data not shown).

Example 2.1: Materials and Methods

5 Reference strains, clinical isolates and culture conditions: Bacterial reference strains were obtained from the American Type Culture Collection (ATCC, Manassas, Va.), the Deutsche Sammlung von Mikroorganismen und Zellkulturen (DSMZ, Braunschweig, Germany), the Collection Institute Pasteur (CIP, Paris, France) or the network on antimicrobial resistance in *Staphylococcus aureus* (NARSA, 10 Herndon, Virginia). *Klebsiella pneumoniae* serotype O3 and serotype O8 were provided by E.M. Nielsen (Department of Bacteriology, Mycology and Parasitology, Statens Serum Institut, Copenhagen, Denmark). Clinical isolates were obtained from the inventors' clinical routine microbiology laboratory.

The following bacteria and fungi were used for evaluation of the specificity of the 15 microarray: *Acinetobacter baumannii* (DSM 30008, 1 clinical isolate), *Pseudomonas aeruginosa* (ATCC27853), *Escherichia coli* (ATCC 25922, CIP 105893, 81.88, 74.14 and 3 clinical isolates), *Klebsiella oxytoca* (DSM 4798, 1 clinical isolate), *Klebsiella pneumoniae* (DSM 681, serotype O3 strain 390 and serotype O8 strain 889), *Proteus mirabilis* (DSM 788, 2 clinical isolates), *Proteus vulgaris* (DSM 2140), 20 *Candida albicans* (ATCC 10231), *Enterococcus casseliflavus* (clinical isolate), *Enterococcus faecalis* (ATCC 29212, 1 clinical isolate), *Enterococcus faecium* (clinical isolate), *Enterococcus gallinarum* (clinical isolate), *Streptococcus agalactiae* (DSM 2134), *Streptococcus angiosus* (DSM 20563), *Streptococcus bovis* (DSM 20480), *Streptococcus dysgalactiae* (DSM 20662), *Streptococcus gordonii* (DSM 25 6777), *Streptococcus mutans* (DSM 20523), *Streptococcus pneumoniae* (ATCC 49619), *Streptococcus pyogenes* (DSM 11723), *Staphylococcus aureus* (ATCC 29213, NRS123 alias MW2, 2 clinical isolates), *Staphylococcus epidermidis* (ATCC 12228, 1 clinical isolates), *Staphylococcus haemolyticus* (DSM 20263), *Staphylococcus hominis* (DSM 20228), *Staphylococcus lugdunensis* (DSM 4804), 30 *Staphylococcus saprophyticus* (ATCC 14953) and *Staphylococcus warneri* (DSM 20316).

Bacterial and fungal reference strains and clinical isolates were grown over night at 37 °C with constant shaking in 5 ml Luria-Bertani (LB) broth or tryptic soy broth

(TSB, 30 g/l, Merck) containing 3 g/l yeast extract. Enterococci and streptococci were grown in 10 ml TSB plus yeast without agitation under 5% CO₂. Overnight cultures were harvested at 2,560 g for 10 min. After discarding the supernatant the pellet was washed in 1 ml TE (10 mM Tris-HCl, pH 7.5 and 1 mM EDTA) and recovered by centrifugation at 17,900 g for 10 min. Cell pellets were used for DNA preparation.

Example 2.2: DNA preparation

For microarray hybridization experiments, DNA was prepared from the strains listed in Example 2.1.

Total cellular DNA was extracted and purified by using the Bacterial Genomic DNS Purification Kit (Edge BioSystems, Gaithersburg, USA). Cell pellets were resuspended in 200 µl lysis buffer (20 mM Tris-HCl, pH 7.5, 50 mM NaCl and 10 mM EDTA, pH 8.0) and lysozyme (Sigma, Taufkirchen, Germany) was added to reach a final concentration of 7.5 mg/ml. In addition, lysostaphin (Sigma) was added to a final concentration of 0.2 mg/ml to promote Staphylococcal lysis or mutanolysin (0.5 U/µl; Sigma) was added to lyse Streptococci and Enterococci. After incubation at 37°C for one hour, 400 µl Sphaeroblast buffer were added and DNA was extracted following the instructions of the supplier.

Candida albicans DNA was extracted using the MasterPure Yeast DNA purification kit (Epicentre Biotechnologies, Madison USA) following the instructions of the manufacturer.

Concentration, purity and size of the purified DNA preparations were determined by UV-spectrophotometry (lambda 40, PerkinElmer, Boston USA) and 1% agarose gel electrophoresis.

Example 2.3: DNA labelling

Prior to labelling, high molecular weight DNA (≥ 12 kb) was fragmented by sonication for 30 sec at an amplitude of 80% (energy input 1500 kJ) using an ultrasonic homogenizer (Sonoplus HD 3080, Bandelin, Berlin, Germany) equipped with a BR30 booster cup for high-intensive irradiation of small and sensitive sample volumes. The size of the fragmented DNA (500-8000 bp) was checked by 1.5% agarose gel electrophoresis. Different amounts of DNA (1 to 5 µg) were then labeled with 3 µl either of Cy5-dCTP or Cy3-dCTP (Amersham Pharmacia Biotech

Europe, Freiburg, Germany) by random priming (1 x random primer/Klenow reaction buffer) using Klenow Polymerase (50 units) (both from BioPrime DNA labeling Kit, Invitrogen, Karlsruhe, Germany) in the presence of 0.12 mM dATP's, dGTP's and dTTP's and 0.06 mM dCTP's, in a total volume of 50 µl. Prior to
 5 labelling, each target DNA was spiked with three gene segments (1 µl each, 30 ng/µl) amplified by PCR from selected recombinant plasmids to serve as internal positive controls. After 2 hours incubation at 37°C, the reaction was interrupted by adding 5 µl of 0.5 M EDTA and unbound label was removed using the QIAquick Purification Kit (QIAGEN, Hilden, Germany). The purified labelled DNA was eluted in
 10 80 µl TE and the relative labelling efficiency of a reaction was evaluated by calculating the approximate ratio of bases to dye molecules (acceptable labelling ratios for nucleic acid were ≤ 60). This ratio and the amount of recovered labelled DNA was determined by measuring the absorbance of the nucleic acids at 260 nm and the absorbance of the dye at its absorbance maximum using a lambda40 UV-
 15 spectrophotometer (PerkinElmer) and plastic disposable cuvettes for the range from 220 nm to 1,600 nm (UVette; Eppendorf, Hamburg, Germany).

Example 2.4: Microarray construction

Cloned PCR-products were used to generate probes for the DNA microarray. All
 20 together 930 gene segments ("probes") were represented on the microarray (Tab. 7). They comprised probes for virulence genes, species specific metabolic and structural genes from *Candida albicans* (86), *Acinetobacter baumannii* (21), *Enterobacter cloacae* (11), *Escherichia coli* (31), *Enterococcus faecalis* (69), *E. faecium* (23), *Klebsiella oxytoca* (21), *K. pneumoniae* (50), *P. aeruginosa* (53),
 25 *Proteus mirabilis* (70), *P. vulgaris* (9), *Stenotrophomonas maltophilia* (13), *Streptococcus agalactiae* (38), *S. dysgalactiae* (1), *S. pneumoniae* (83), *S. pyogenes* (42), *S. viridans* (19, including probes for *S. mutans* and *S. bovis*), Streptococci (2), *Staphylococcus aureus* (69), *S. epidermidis* (35), *S. haemolyticus* (7), *S. hominis* (1), *S. lugdunensis* (6), *S. saprophyticus* (2) and *S. warneri* (7), as
 30 well as for bacterial antibiotic resistant determinants (131), and positive and negative controls (29).

Tab. 7: Gene probes on array of example 2.

n	Probe Name	SeqID
---	------------	-------

n	Probe Name	SeqID
1	16SKpn_1_1	934
2	16SrRNAPrmi_1_1	940
3	16SRNAEf_1_1	936
4	16SRNAEf_2_1	933
5	16SShaemolyt_1_1	938
6	16SShominis_1_1	937
7	16SStrepagalactiae_1_1	930
8	16SPa_1_1	926
9	16SSa_1_1	942
10	16SSa_3_1	935
11	16SStrepneu_1_1	929
12	16SStrepyog_1_1	928
13	16SKlox_1_1	943
14	16SrRNAPrvu1_1_1	941
15	16SEfaecium_1_1	931
16	16SEfaecium_2_1	932
17	23SEfaecium_1_1	939
18	23SEfaecium_2_1	927
19	ARHGDIA(hu)_1_1	923
20	b-Act(hu)_1_1	922
21	GAPD(hu)_1_1	921
22	LDHA(hu)_1_1	920
23	PGK1(hu)_1_1	924
24	rbcL_1_1	919
25	rbcL_1_2	925
26	aac(6p)-lb7_1_1	2867
27	aacA-aphD_1_1	843
28	aacA4ENCL_1_1	2864
29	aacC2_1_1	833
30	aadB_1_2	836
31	aadD_1_1	837
32	adeA-ACIBA_1_1	2866
33	adeB-ACIBA_1_1	2868
34	adeC-ACIBA_1_1	2869
35	AdeR-ACIBA_1_1	2865
36	AdeS-ACIBA_1_1	2870
37	aph-A3_1_1	840
38	strA_1_1	839
39	strB_1_1	834
40	aacA_aphDStwar_1_1	831
41	aacA4_1_1	842
42	aacA4_1_2	838
43	aacC1_1_1	841
44	aacC1_1_2	832
45	aadA_1_1	835
46	aphA3_1_1	845

n	Probe Name	SeqID
47	ampC-ENCL_1_1	2874
48	ampC_1_1	789
49	ampR_1_1	2873
50	blaA_1_1	823
51	blaB_1_1	788
52	blaShaemolyt_1_1	803
53	blaL1_1_1	2875
54	blaL2_1_1	2871
55	blaMIR-3_1_1	2872
56	blaOXA-1_1_1	828
57	blaOXY-KLOX_1_1	816
58	blaSHV-1_1_1	794
59	blaTEM-106_1_1	815
60	blavim_1_1	804
61	blaZ_1_1	827
62	cumA_1_1	819
63	femA_1_1	801
64	femBShaemolyt_1_1	820
65	fmhA_1_1	825
66	fmhB_1_1	818
67	ftsWEF_1_1	817
68	mecA_1_1	802
69	mecISepid_1_1	786
70	pbp1a_1_1	813
71	pbp2aStrpneu_1_1	793
72	pbp2x_1_1	807
73	pbp3Saureuc_1_1	808
74	pbp4_1_1	809
75	pbp5Efaecium_1_1	810
76	pbpC_1_1	811
77	psrb_1_1	824
78	bla-CTX-M-22_1_1	792
79	bla_FOX-3_1_1	822
80	blaIMP-7_1_1	785
81	blaIMP-7_1_2	797
82	blaOXA-10_1_2	787
83	blaOXA-2_1_1	795
84	blaOXA-32_1_1	791
85	blaOXY_1_1	799
86	blaPER-1_1_1	821
87	blaPrmi_1_1	830
88	blaRShaemolyt_1_1	796
89	dacCStrpyog_1_1	800
90	fox-6_1_1	829
91	mecR1Sepid_1_1	826
92	pbp2b_1_1	805

n	Probe Name	SeqID
93	pbp2primeSepid_1_1	806
94	cat_1_1	862
95	catEfaecium_1_1	861
96	cmlA5_1_1	860
97	ble_1_1	875
98	ddl_1_1	874
99	vanRB2_1_1	870
100	vanSB2_1_1	872
101	vanWB2_1_1	873
102	vanXB2_1_1	876
103	vanA_1_1	867
104	vanB_1_1	879
105	vanC-2_1_1	881
106	vanH(tn)_1_1	866
107	vanHB2_1_1	868
108	vanR_1_1	869
109	vanS(tn)_1_1	871
110	vanX(tn)_1_1	882
111	vanY(tn)_1_1	877
112	vanYB2_1_1	878
113	vanZ(tn)_1_1	880
114	ermA_1_1	852
115	ermB_1_2	851
116	ermC_1_1	846
117	linB_1_1	847
118	mdrSA_1_1	849
119	mefA_1_1	856
120	mphBM_1_1	855
121	mrX_1_1	857
122	msrA_1_1	854
123	satA_1_1	853
124	satSA_1_1	848
125	abcXStrpmut_1_1	894
126	acrA_1_1	892
127	acrB_1_1	883
128	acrR_1_1	890
129	albA_1_1	898
130	arr2_1_1	906
131	cadBStalugd_1_1	888
132	elkT-abcA_1_1	896
133	emeA_1_1	891
134	mexA_1_1	889
135	mexB_1_2	884
136	mexR_1_1	905
137	mreA_1_1	907
138	norA23_1_1	904

n	Probe Name	SeqID
139	nov_1_1	901
140	qacEdelta1_1_1	895
141	rtn_1_1	893
142	sul_1_1	887
143	sull_1_1	886
144	sulll_1_1	2888
145	wbbl_1_1	903
146	wzm_1_1	899
147	wzt_1_1	902
148	msrCb_1_1	900
149	uvrA_1_1	909
150	tetA-ACIBA_1_1	2907
151	tetAJ_1_1	863
152	tetL_1_1	864
153	tetM_1_1	865
154	tetR-ACIBA_1_1	2908
155	dfrA_1_1	859
156	dfrStrpneu_1_1	858
157	AAF1_1_1	247
158	ALS1_1_1	249
159	ALS7_1_1	250
160	ASL43f_1_1	232
161	BGL2_1_1	233
162	CACHS3_1_1	234
163	CEF3_1_1	237
164	CHS1_1_1	238
165	CHS2_1_1	239
166	CHS4_1_1	240
167	CHS5_1_1	241
168	CHT1_1_1	242
169	CHT2_1_1	243
170	CHT4_1_1	244
171	CSA1_1_1	245
172	GSC1_1_1	257
173	GSL1_1_1	258
174	HWP1_2_1	261
175	HYR1_1_1	262
176	INT1a_1_1	263
177	KRE15f_1_1	264
178	KRE6_1_1	265
179	KRE9_1_1	266
180	MP65_1_1	269
181	PHR1_1_1	272
182	PHR2_1_1	273
183	PHR3_1_1	274
184	PRA1_1_1	275

n	Probe Name	SeqID
185	RBT1_1_1	277
186	RBT4_1_1	278
187	RHO1_1_1	279
188	RVS167_1_1	283
189	SKN1_1_1	285
190	TCA1_1_1	287
191	YAE1_1_1	289
192	CDR1_1_1	911
193	CDR1_2_1	912
194	CRD2_1_1	910
195	ERG11_1_1	917
196	FET3_1_1	914
197	FTR2_1_1	915
198	MDR1-7_1_1	916
199	MET3_1_1	913
200	SEC20_1_1	918
201	ADH1_1_1	248
202	ARG56_1_1	231
203	ESS1_1_1	253
204	GAP1_1_1	255
205	GNA1_1_1	256
206	HIS1_1_1	259
207	MLS1_1_1	268
208	NDE1_1_1	270
209	PFK2_1_1	271
210	SRB1_1_1	286
211	TRP1_1_1	288
212	YRB1_1_1	290
213	5triphosphatase_1_1	246
214	CCT8_1_1	235
215	CDC37_1_1	236
216	EDT1_1_1	251
217	ELF_1_1	252
218	FAL1_1_1	254
219	HTS1_1_1	260
220	MIG1_1_1	267
221	PRS1_1_1	276
222	RNR1_1_1	280
223	RPB7_1_1	281
224	RPL13_1_1	282
225	SHA3_1_1	284
226	YST1exon2_1_1	291
227	CCN1_1_1	292
228	CDC28_1_1	293
229	CLN2_1_1	294
230	CPH1_1_1	295

n	Probe Name	SeqID
231	CYB1_1_1	296
232	EFG1_1_1	297
233	MNT1_1_1	298
234	RBF1_1_1	299
235	RBF1_2_1	300
236	RIM101_1_1	301
237	RIM8_1_1	302
238	SEC14_1_1	303
239	SEC4_1_1	304
240	TUP1_1_1	305
241	YPT1_1_1	306
242	ZNF1CZF1_2_1	307
243	carO_1_1	2843
244	csuA_1_1	2854
245	csuA_B_1_1	2853
246	csuB_1_1	2852
247	csuC_1_1	2849
248	csuD_1_1	2848
249	dhbA_1_1	2845
250	dhbB_1_1	2846
251	gacS_1_1	2844
252	sid_1_1	2847
253	tnp-ACIBA_1_1	2850
254	waaA-ACIBA_1_1	2851
255	abc_1_1	2857
256	cysI_1_1	2860
257	dec_1_1	2859
258	furACIBA_1_1	2858
259	ompA-ACIBA_1_1	2863
260	por_1_1	2856
261	put1_1_1	2855
262	put3_1_1	2862
263	trpE_1_1	2861
264	asr_1_1	2876
265	ehuA_1_1	2885
266	ehuS_1_1	2878
267	ehuT_1_1	2883
268	ehuU_1_1	2882
269	ehuV_1_1	2879
270	lacZ_1_1	2877
271	ORF165_1_1	2881
272	ORF295_1_1	2884
273	ORF400_1_1	2886
274	slyA_1_1	2880
275	b1169_1_1	142
276	envZ_1_1	143

n	Probe Name	SeqID
277	fliCb_1_1	144
278	nfrB_1_1	145
279	nlpA_1_1	146
280	pilAe_1_1	147
281	yacH_1_1	148
282	yagX_1_1	149
283	ycdS_1_1	150
284	yciQ_1_1	151
285	ymcA_1_1	152
286	b1202_1_1	153
287	eae_1_1	154
288	eltB_1_1	155
289	escR_1_1	156
290	escT_1_1	157
291	escU_1_1	158
292	espB_1_1	159
293	fes_1_1	160
294	fes_2_1	161
295	fteA_1_1	162
296	hlyA_1_1	163
297	hlyB_1_1	164
298	iucA_1_1	165
299	iucB_1_1	166
300	iucC_1_1	167
301	papG_1_1	168
302	rfbE_1_1	169
303	shuA_1_1	170
304	SLTII_1_1	171
305	toxA-LTPA_1_1	172
306	VT2vaB_1_1	173
307	ABC-eltA_1_1	317
308	agrBfs_1_1	318
309	agrCfs_1_1	319
310	arcA_1_1	308
311	arcC_1_1	309
312	bkdA_1_1	310
313	cad_1_1	311
314	camE1_1_1	312
315	csrA_1_1	313
316	dacA_1_1	314
317	dfr_1_1	315
318	dhoD1a_1_1	316
319	dnaE_1_1	320
320	ebsA_1_1	321
321	ebsB_1_1	322
322	eep_1_1	323

n	Probe Name	SeqID
323	efaR_1_1	324
324	glS24_glsB_1_1	325
325	gph_1_1	326
326	gyrAEf_1_1	327
327	metEf_1_1	328
328	mntHCB2_1_1	329
329	mob2_1_1	330
330	mvaD_1_1	331
331	mvaE_1_1	332
332	parC_1_1	333
333	pcfG_1_1	334
334	phoZ_1_1	335
335	polC_1_1	336
336	ptb_1_1	337
337	recS1_1_1	338
338	rpoN_1_1	339
339	tms_1_1	340
340	tyrDC_1_1	341
341	tyrS_1_1	342
342	ace_1_1	351
343	asa1_1_1	343
344	asp1_1_1	344
345	cgh_1_1	345
346	cylA_1_1	346
347	cylB_1_1	347
348	cylI_1_1	348
349	cylL_cylS_1_1	349
350	cylM_1_1	350
351	ef00108_1_1	352
352	ef00109_1_1	353
353	ef0011_1_1	354
354	ef00113_1_1	355
355	ef0012_1_1	356
356	ef0022_1_1	357
357	ef0031_1_1	358
358	ef0032_1_1	359
359	ef0040_1_1	360
360	ef0058_1_1	361
361	enIA_1_1	362
362	esa_1_1	363
363	esp_1_1	364
364	gelE_1_1	365
365	groEL_1_1	366
366	groES_1_1	367
367	rt1_1_1	368
368	sala_1_1	369

n	Probe Name	SeqID
369	salb_1_1	370
370	sea1_1_1	371
371	sep1_1_1	372
372	vicK_1_1	373
373	yycH_1_1	374
374	yycI_1_1	375
375	yycJ_1_1	376
376	bglB_1_1	377
377	bglR_1_1	378
378	bglS_1_1	379
379	efmA_1_1	380
380	efmB_1_1	381
381	efmC_1_1	382
382	mreC_1_1	383
383	mreD_1_1	384
384	mvaDEfaecium_1_1	385
385	mvaEEfaecium_1_1	386
386	mvaK1Efaecium_1_1	387
387	mvaK2Efaecium_1_1	388
388	mvaSEfaecium_1_1	389
389	orf3_4Efaeciumb_1_1	390
390	orf6_7Efaecium_1_1	391
391	orf7_8Efaecium_1_1	392
392	orf9_10Efaecium_1_1	393
393	entA_entI_1_1	394
394	entD_1_1	395
395	entR_1_1	396
396	oep_1_1	397
397	sagA_1_2	398
398	H+ATPase_1_1	2887
399	cymA_1_1	449
400	cymD_1_1	450
401	cymE_1_1	451
402	cymH_1_1	452
403	cymI_1_1	453
404	cymJ_1_1	454
405	ddrA_1_1	455
406	fdt-1_1_1	456
407	fdt-2_1_1	457
408	fdt-3_1_1	458
409	gatY_1_1	459
410	hydH_1_1	460
411	masA_1_1	461
412	nasA_1_1	462
413	nasE_1_1	463
414	nasF_1_1	464

n	Probe Name	SeqID
415	pehX_1_1	465
416	pelX_1_1	466
417	tagH_1_1	467
418	tagK_1_1	468
419	tagT_1_1	469
420	acoA_1_1	408
421	acoB_1_1	409
422	acoC_1_1	410
423	ahlK_1_1	411
424	atsA_1_1	399
425	atsB_1_1	400
426	budC_1_1	401
427	citA_1_1	402
428	citW_1_1	403
429	citX_1_1	404
430	dalD_1_1	405
431	dalk_1_1	406
432	dalT_1_1	407
433	fimK_1_1	412
434	glfKPN2_1_1	413
435	liac_1_1	431
436	ltrA_1_1	414
437	mdcC_1_1	415
438	mdcF_1_1	416
439	mdcH_1_1	417
440	mrkA_1_1	418
441	mtrK_1_1	419
442	nifF_1_1	420
443	nifK_1_1	421
444	nifN_1_1	422
445	tyrP_1_1	423
446	ureA_1_1	424
447	wbbO_1_1	425
448	wza_1_1	426
449	wzb_1_1	427
450	wzmKPN2_1_1	428
451	wztKPN2_1_1	429
452	yojH_1_1	430
453	aldA_1_1	433
454	aldA_2_1	434
455	cim_1_1	432
456	hemly_1_1	435
457	pSL017_1_1	436
458	pSL020_1_1	437
459	rcaA_1_1	438
460	rmlC_1_1	439

n	Probe Name	SeqID
461	rmID_1_1	440
462	waaG_1_1	441
463	wbbD_1_1	442
464	wbbM_1_1	443
465	wbbN_1_1	444
466	wbdA_1_1	445
467	wbdC_1_1	446
468	wztKpn_1_1	447
469	yibD_1_1	448
470	glpR_1_1	470
471	lasRb_1_1	471
472	OrfX_1_1	472
473	pa0260_1_1	473
474	pa0572_1_1	474
475	pa0625_1_1	475
476	pa0636_1_1	476
477	pa1046_1_1	477
478	pa1069_1_1	478
479	pa1846_1_1	479
480	pa3866_1_1	480
481	pa4082_1_1	481
482	pilAp_1_1	482
483	PilAp2_1_1	483
484	pilC_1_1	484
485	PstP_1_1	485
486	purK_1_1	486
487	uvrDII_1_1	487
488	vsml_1_1	488
489	vsmR_1_2	489
490	xcpX_1_1	490
491	algB_1_1	494
492	algN_1_1	495
493	algR_1_1	496
494	aprA_1_1	491
495	aprE_1_1	492
496	ctx_1_2	493
497	ExoS_1_1	497
498	fpvA_1_1	498
499	lasRa_1_1	499
500	lipA_1_1	500
501	lipH_1_1	501
502	Orf159_1_2	502
503	Orf252_1_1	503
504	pchG_1_1	504
505	PhzA_1_1	505
506	PhzB_1_1	506

n	Probe Name	SeqID
507	PLC_1_1	507
508	plcN_1_1	508
509	plcR_1_1	509
510	pvdD_1_1	510
511	pvdF_1_2	511
512	pyocinS1_1_1	512
513	pyocinS1im_1_1	513
514	pyocinS2_1_1	514
515	pys2_1_1	515
516	pys2_2_1	516
517	rbf303_1_1	517
518	rhIA_1_1	518
519	rhIB_1_1	519
520	rhIR_1_1	520
521	TnAP41_1_2	521
522	toxA_1_1	522
523	aad_1_1	711
524	atfA_1_1	706
525	atfB_1_1	707
526	atfC_1_1	708
527	ccmPrmi1_1_1	709
528	cyaPrmi_1_1	710
529	flfB_1_1	712
530	flfD_1_1	713
531	flfN_1_1	714
532	flhD_1_1	715
533	floA_1_1	716
534	ftsK_1_1	717
535	gstB_1_1	718
536	hemCPrmi_1_1	719
537	hemDPrmi_1_1	720
538	hev_1_1	721
539	katA_1_1	722
540	lpp1_1_1	723
541	menE_1_1	724
542	mfd_1_1	725
543	nrpA_1_1	726
544	nrpB_1_1	727
545	nrpG_1_1	728
546	nrpS_1_1	729
547	nrpT_1_1	730
548	nrpU_1_1	731
549	pat_1_1	732
550	pmfA_1_1	733
551	pmfC_1_1	734
552	pmfE_1_1	735

n	Probe Name	SeqID
553	ppaA_1_1	736
554	rsbA_1_1	737
555	rsbC_1_1	738
556	speB_1_1	739
557	stmA_1_1	740
558	stmB_1_1	741
559	terA_1_1	742
560	terD_1_1	743
561	umoA_1_1	744
562	umoB_1_1	745
563	umoC_1_1	746
564	ureR_1_1	747
565	xerC_1_1	748
566	ygbA_1_1	749
567	flaA_1_1	750
568	flaD_1_1	751
569	fliA_1_1	752
570	hpmA_1_1	753
571	hpmB_1_1	754
572	lpsPrmi_1_1	755
573	mrpA_1_1	756
574	mrpB_1_1	757
575	mrpC_1_1	758
576	mrpD_1_1	759
577	mrpE_1_1	760
578	mrpF_1_1	761
579	mrpG_1_1	762
580	mrpH_1_1	763
581	mrpI_1_1	764
582	mrpJ_1_1	765
583	patA_1_1	766
584	putA_1_1	767
585	uca_1_1	768
586	ureDPrmi_1_1	769
587	ureEPrmi_1_1	770
588	ureFPrmi_1_1	771
589	zapA_1_1	772
590	zapB_1_1	773
591	zapD_1_1	774
592	zapE_1_1	775
593	envZPrvu_1_1	776
594	frdC_1_1	777
595	frdD_1_1	778
596	infBPrvu_1_1	779
597	lad_1_1	780
598	tna2_1_1	781

n	Probe Name	SeqID
599	end_1_1	782
600	pqrA_1_1	783
601	urg_1_1	784
602	eD_2_1	2892
603	eE_1_1	2890
604	eF_1_1	2899
605	et_1_1	2898
606	ORF2-STEMA_1_1	2897
607	ORF4-STEMA_1_1	2896
608	pam_1_1	2895
609	pmp-STEMA_1_1	2894
610	ppi_1_1	2893
611	smeE_1_1	2889
612	smeF4494_1_1	2901
613	StmPr1_1_1	2891
614	StmPr2_1_1	2900
615	0487Straga_1_1	625
616	0488Straga_1_1	626
617	0493Straga_1_1	627
618	0495Straga_1_1	628
619	0498Straga_1_1	629
620	0500Straga_1_1	630
621	0502Straga_1_1	631
622	0504Straga_1_1	632
623	cpsA1Strgal_1_1	606
624	cpsB1Strgal_1_1	607
625	cpsC1Strgal_1_1	608
626	cpsD1Strgal_1_1	609
627	cpsE1Strgal_1_1	610
628	cpsG1Strgal_1_1	611
629	cpsI1Strgal_1_1	612
630	cpsJ1Strgal_1_1	613
631	cpsK1Strgal_1_1	614
632	cpsM1Strgal_1_1	615
633	cpsY1Strgal_1_1	616
634	cpsY2Strgal_2_1	617
635	cylBStraga_1_1	618
636	cylEStraga_1_1	619
637	cylFStraga_1_1	620
638	cylHStraga_1_1	621
639	cylI1Straga_1_1	622
640	cylJ1Straga_1_1	623
641	cylK1Straga_1_1	624
642	folDStraga_1_1	633
643	neuA1Strgal_1_1	634
644	neuB1Strgal_1_1	635

n	Probe Name	SeqID
645	neuC1Strgal_1_1	636
646	neuD1Strgal_1_1	637
647	recNStraga_1_1	638
648	0499Straga_1_1	642
649	CAMPfactor_1_1	640
650	CAMPfactor_2_1	641
651	hylStragal_1_1	643
652	lipStragal_1_1	644
653	16SStrepdysgal_1_1	2842
654	1760Strpneu_1_1	546
655	acyPStrpneu_1_1	547
656	cap1EStrpneu_1_1	523
657	cap1FStrpneu_1_1	524
658	cap1GStrpneu_1_1	525
659	cap3AStrpneu_1_1	526
660	cap3BStrpneu_1_1	527
661	celAStrpneu_1_1	528
662	celBStrpneu_1_1	529
663	cglAStrpneu_1_1	530
664	cglBStrpneu_1_1	531
665	cglCStrpneu_1_1	532
666	cglDStrpneu_1_1	533
667	cinA_1_1	534
668	cps14EStrpneum_1_1	535
669	cps14FStrpneum_1_1	536
670	cps14GStrpneum_1_1	537
671	cps14HStrpneum_1_1	538
672	cps19aHStrpneum_1_1	539
673	cps19aIStrpneum_1_1	540
674	cps19aKStrpneum_1_1	541
675	cps19fGStrpneum_1_1	542
676	cps23fGStrpneum_1_1	543
677	dexB_1_1	544
678	dinF_1_1	545
679	endAStrpneu_1_1	548
680	exoAStrpneu_1_1	549
681	exp72_1_1	550
682	fnlAStrpneu_1_1	551
683	fnlBStrpneu_1_1	552
684	fnlCStrpneu_1_1	553
685	gct18Strpneum_1_1	554
686	hexB1_1_1	555
687	hftsHstrpneu_1_1	556
688	immunofrag1Strpneu_1_1	557
689	immunofrag2Strpneu_2_1	558
690	immunofrag3Strpneu_2_1	559

n	Probe Name	SeqID
691	kdtBStrpneu_1_1	560
692	lysAStrpneu_1_1	561
693	pcpBStrpneu_1_1	562
694	pflCStrpneu_1_1	563
695	plpA_1_1	564
696	prtA1Strpneu_1_1	565
697	pspC1Strpneu_1_1	566
698	pspC2_1_1	567
699	purRStrpneu_1_1	568
700	pyrDAStrpneum_1_1	569
701	SP0828Strpneu_1_1	570
702	SP0830Strpneu_1_1	571
703	SP0833Strpneu_1_1	572
704	SP0837_38Strpneu_1_1	573
705	SP0839Strpneu_1_1	574
706	ugdStrpneu_1_1	575
707	uncC_1_1	576
708	vicXStrepneu_1_1	577
709	wchA6bStrpneum_1_1	578
710	wci4Strpneum_1_1	579
711	wciK4Strpneum_1_1	580
712	wciL4Strpneum_1_1	581
713	wciN6bStrpneum_1_1	582
714	wciO6bStrpneum_1_1	583
715	wciP6bStrpneum_1_1	584
716	wciY18Strpneum_1_1	585
717	wzdbStrpneum_1_1	586
718	wze6bStrpneum_1_1	587
719	wzy18Strpneum_1_1	588
720	wzy4Strpneum_1_1	589
721	wzy6bStrpneum_1_1	590
722	xpt_1_1	591
723	igaStrpneu_1_1	592
724	lytA_1_1	593
725	nanA_1_1	594
726	nanBStrpneu_1_1	595
727	pcpCStrpneu_1_1	596
728	ply_1_1	597
729	prtAStrpneu_1_1	598
730	pspA_1_2	599
731	SP0834Strpneu_1_1	600
732	SP0834Strpneu_1_2	601
733	sphtraStrpneu_1_1	602
734	wciJStrpneu_1_1	603
735	wziyStrpneu_1_1	604
736	wzxStrpneu_1_1	605

n	Probe Name	SeqID
737	cyclStrpyog_1_1	645
738	fah_rph_hlo_Strpyog_1_1	646
739	int_1_1	647
740	int315.5_1_1	648
741	murEStrpyog_1_1	649
742	oppA_1_1	650
743	oppCStrpyog_1_1	651
744	oppD_1_1	652
745	SPy0382Strpyog_1_1	653
746	SPy0390Strpyog_1_1	654
747	SpyM3_1351_1_1	655
748	vicXStrpyog_1_1	656
749	DNaseIStrpyog_1_1	657
750	fba2Strpyog_1_1	658
751	fhuAStrpyog_1_1	659
752	fhuB1Strpyog_1_1	660
753	fhuDStrpyog_1_1	661
754	fhuGStrpyog_1_1	662
755	hlyA_1_1	663
756	hlyP_1_1	664
757	hlyP2_1_1	665
758	oppB_1_1	666
759	ropB_1_1	667
760	scpAStrpyog_1_1	668
761	sloStrpyog_1_1	669
762	smez-4Strpyog_1_1	670
763	sof_1_1	671
764	sof_2_1	672
765	speA_1_1	673
766	speB2Strpyog_1_1	674
767	speCStrpyog_1_1	675
768	speJStrpyog_1_1	676
769	srtBStrpyog_1_1	677
770	srtCStrpyog_1_1	678
771	srtEStrpyog_1_1	679
772	srtFStrpyog_1_1	680
773	srtGStrpyog_1_1	681
774	srtIStrpyog_1_1	682
775	srtKStrpyog_1_1	683
776	srtRStrpyog_1_1	684
777	srtTStrpyog_1_1	685
778	vicKStrpyog_1_1	686
779	573Stprmut_1_1	687
780	580SStprmut_1_1	688
781	581_582SStprmut_1_1	689
782	584SStprmut_1_1	690

n	Probe Name	SeqID
783	dltAStrmut_1_1	691
784	dltBStrmut_1_1	692
785	dltCpx1Strmut_1_1	693
786	dltDStrmut_1_1	694
787	lichStrbov_1_1	695
788	lytRStprmut_1_1	696
789	lytSStprmut_1_1	697
790	pepQStrrmut_1_1	698
791	pflCStrmut_1_1	699
792	recNStprmut_1_1	700
793	ytqBStrmut_1_1	701
794	hlyXStrmut_1_1	702
795	igaStrmitis_1_1	703
796	igaStrsanguis_1_1	704
797	perMStrmut_1_1	705
798	fasCAXStrdysg_1_1	2904
799	sloStrep_1_1	2905
800	cataSaur_1_1	1
801	cataSaur_1_2	2
802	clfA_1_1	3
803	clfB_1_1	4
804	coa_1_1	5
805	coa_1_2	6
806	coa_2_2	2903
807	coa_3_1	2902
808	epiP-bsaP_1_1	58
809	geh_1_1	59
810	gyrA_1_1	60
811	gyrB_1_1	61
812	hemB_1_1	62
813	hemC_1_1	63
814	hemD_1_1	64
815	hemN_1_1	65
816	hsdS_1_1	66
817	hsdS_2_1	67
818	lip_1_1	68
819	menC_1_1	69
820	murC_1_1	70
821	nuc_1_1	71
822	pdhD_1_1	72
823	rpoB_1_1	73
824	SAV0431_1_1	74
825	SAV0439_1_1	75
826	SAV0440_1_1	76
827	SAV0441_1_1	77
828	sigB_1_1	78

n	Probe Name	SeqID
829	spa_1_2	79
830	sstC_1_1	80
831	tag_1_1	81
832	tyrA_1_1	82
833	bsaE_1_1	100
834	bsaG_1_1	101
835	cap5h_1_1	102
836	cap5i_1_1	103
837	cap5j_1_1	104
838	cap5k_1_1	105
839	cap8H_1_1	106
840	cap8I_1_1	107
841	cap8J_1_1	108
842	cap8K_1_1	109
843	EDIN_1_1	113
844	eta_1_1	114
845	etb_1_1	115
846	hglA_1_1	116
847	hglA_2_1	117
848	hglB_1_1	118
849	hglC_2_1	119
850	hla_1_1	120
851	hIb_1_2	121
852	lukF_1_1	122
853	lukS_1_1	123
854	lukS_2_1	124
855	NAG_1_1	125
856	sak_1_1	126
857	sea_1_1	127
858	seb_1_1	128
859	sec1_1_1	129
860	seg_1_1	130
861	seh_1_1	131
862	sel_1_1	132
863	set15_1_1	133
864	set6_1_1	134
865	set7_1_1	135
866	set8_1_1	136
867	sprV8_1_1	137
868	tst_1_1	138
869	agrB_1_1	178
870	agrC_1_1	179
871	alphSE1368_1_1	180
872	ardeSE0106_1_1	174
873	ardeSE0107_1_1	175
874	aroI SE0105_1_1	176

n	Probe Name	SeqID
875	atlE_1_1	177
876	gad_1_1	181
877	glucSE1191_1_1	182
878	hsp10_1_1	183
879	icaA_1_1	184
880	icaB_1_1	185
881	mvaSSepid_1_1	186
882	nitreSE1972_1_1	187
883	nitreSE1974_1_1	188
884	nitreSE1975_1_1	189
885	oiamtSE1209_1_1	190
886	ORF1Sepid_1_1	191
887	ORF3bSepid_1_1	192
888	qacR_1_1	193
889	sin_1_1	194
890	ureSE1861_1_1	195
891	ureSE1863_1_1	196
892	ureSE1864_1_1	197
893	ureSE1865_1_1	198
894	ureSE1867_1_1	199
895	gcaD_1_1	200
896	hld_orf5_1_1	201
897	icaC_1_1	202
898	icaD_1_1	203
899	icaR_1_1	204
900	psm_beta1and2_1_1	205
901	purR_1_1	206
902	spoVG_1_1	207
903	yabJ_1_1	208
904	folQShaemolyt_1_1	209
905	mvaCShaemolyticus_1_1	210
906	mvaDShaemolyt_1_1	211
907	mvaK1Shaemolyticus_1_1	212
908	mvaSShaemolyticus_1_1	213
909	RNApolsigm_1_1	214
910	lipShaemolyt_1_1	215
911	ydhK_1_1	2906
912	agrB2Stalugd_1_1	216
913	agrC2Stalugd_1_1	217
914	agrCStalugd_1_1	218
915	slamStalugd_1_1	219
916	fblStalugd_1_1	220
917	slushABCStalugd_1_1	221
918	RNApolsigmSsapro_1_1	222
919	RNApolsigmSsapro_1_2	223
920	msrw1Stwar_1_1	224

n	Probe Name	SeqID
921	nukMStwar_1_1	225
922	proDStwar_1_1	226
923	proMStwar_1_1	227
924	sigrpoStwar_1_1	228
925	tnpStwar_1_1	229
926	gehAStwar_1_1	230
927	0135mihck_1_1	945
928	0270cap_1_1	947
929	FAN_1_1	946
930	p53_1_1	944

All genes were selected from the literature and databases, compared by BLAST analysis to all other sequences available in the NCBI database. Primers were designed to amplify gene segments of 200 to 800 bp length devoid of apparent
5 homology with genes of other bacterial species and *Homo sapiens*. Gene segments were amplified by using the puReTaq Ready-To-Go PCR beads (Amersham Biosciences, Freiburg, Germany) and cloned into the pDrive Cloning Vector (Qiagen, Hilden, Germany) according to the recommendations of the suppliers and transformed into competent *Escherichia coli* (XL-1-Blue) cells using the calcium
10 chloride protocol (Sambrook, J. and Russell, D.W. 2001. Molecular cloning: a laboratory manual, 3rd ed. Cold Spring Harbor Laboratory Press, New York, N.Y). For quality control purposes, all gene probes were partially sequenced and verified (with the BigDye kit 1.1 and an 377 DNA sequencer; Applied Biosystems, Foster City, USA). All sequences obtained were identical or substantially identical (>90%
15 sequence identity) to those obtained from the database. For DNA-probe production 930 recombinant plasmids containing the 930 selected gene segments were used for re-amplification. Amplicons were purified and spotted in 4 replicates per slide on UltraGAPS™ Coated Slides (gamma amino propyl silane coated slides, Corning, NY, USA). Approximately 1 nl DNA (with a concentration of
20 about 0.1 to about 0.2 ng/nl) per spot was spotted onto the slide with a Biorobitics Microgrid Microarrayer (Genomic Solutions, Ann Arbor, MI, USA).

Example 2.5: Hybridization and scanning

All experiments described represent dual co-hybridizations of two different target
25 DNA samples labelled respectively with Cy3 or Cy5. After removal of unbound label, Cy3 and Cy5 labelled DNAs were pooled and mixed with 10 µg of Salmon Sperm

DNA and 50 µg of poly-A-DNA. The mixture was frozen in liquid nitrogen and lyophilized in the dark. Prior to hybridization the target DNA was reconstituted in 110 µl hybridization solution (30% formamide, 0.1% SDS, 5xSSC) and denatured by heating at 95°C for 3 min prior to hybridization. Hybridization was automatically performed with a TECAN Hybridization Station (HS400, TECAN, Salzburg, Austria). The arrays were prewashed at 42°C for 1 min with 5x SSC and prehybridized in 110 µl denatured prehybridization buffer (30% formamide, 0.1% SDS, 5xSSC, 10mg/ml BSA) for 30 min at 42°C at mild agitation. After injection of 110 µl labelled DNA, hybridization was performed at 60°C for 18 hours at medium agitation. The arrays were washed at 42°C in wash buffer I (1x SSC, 0.1% SDS) - three cycles of 30 sec wash time and 2 min soak time -, in wash buffer II (0.1x SSC, 0.1% SDS) - five cycles of 30 sec wash time and 2 min soak time - and wash buffer III (0.1x SSC) - four cycles of 30 sec wash time and 2 min soak time - and finally dried at 30°C with N₂ (2.7 bar) for 3 min. Hybridized arrays were scanned with GenPix Personal Axon 4100A laser scanner (Axon Instruments, Union City, CA, USA). Laser light of wavelengths at 532 and 635 nm was used to excite Cy3 dye and Cy5 dye, respectively. Fluorescent images were analyzed by the GenePix Pro 6.0 and Acuity 4.0 software (Axon Instruments). For each feature (gene probe) the median pixel intensity of wavelength 635 nm or 532 nm, respectively, was determined and the median background of the respective wavelength subtracted (F635 Median - B635 and F532 Median - B532, respectively).

Example 2.6: Specificity

In order to allow the simultaneous and rapid identification, differentiation and characterisation of pathogens causing sepsis, a microarray comprising a set of 930 gene probes of 200 to 800 bp length was developed (Tab. 7). The clinically most relevant sepsis causing pathogens were represented on the microarray by gene probes specific for the genera and species *E. coli* (31), *Staphylococcus aureus* (69) and coagulase negative staphylococci (58), *P. aeruginosa* (53), *Streptococcus* spp. (185), *Enterococcus* spp.(92), *Proteus* spp. (79), *Klebsiella* spp.(71), *Enterobacter* spp. (11), *Stenotrophomonas maltophilia* (13), *Acinetobacter baumannii* (21) and *Candida albicans* (86). To allow for parallel detection of antibiotic resistance determinants, the array contained 131 bacterial resistance gene probes.

To facilitate the optimization, validation and standardization of microarray analysis, a set of 29 control probes was included. Different 16S rRNA gene probes (18) served as positive hybridization controls for bacterial DNA. The gene probe rbcL_1_2 (segment of the rubisco gene of *Hordeum vulgare*) was prelabelled with Cy3 and Cy5 and spotted onto each subarray for visualisation of the array orientation. Gene probes derived from *Mus musculus* (2), *Dictyostelium discoideum* (2), *Homo sapiens* (5), *Hordeum vulgare* (1) were included as negative or positive hybridization controls. In all assays, one to five PCR-amplified DNA-segments, which had been added to each DNA preparation as a positive control, hybridized with the corresponding probes, indicating that labelling and hybridization had performed efficiently.

The specificity of the DNA-chip was validated with 44 well characterized clinical isolates and reference strains of the target species (40) as well as other related bacteria (4) (Table 8).

Tab. 8: Microorganism strains used for microarray validation. Non-target species are Nos 21, 25, 27 and 30.

No	Species	Strain	Dye
1	<i>A. baumannii</i>	DSM 30008	Cy5
2	<i>A. baumannii</i>	5256-2	Cy3
3	<i>P. aeruginosa</i>	ATCC 27853	Cy3
4	<i>E. coli</i>	CIP 105893	Cy3
5	<i>E. coli</i>	ATCC 25922	Cy5
6	<i>E. coli</i>	CIP 81.88	Cy3
7	<i>E. coli</i>	CIP 74.14	Cy5
8	<i>E. coli</i>	U10338-1	Cy5
9	<i>E. coli</i>	U10164-2	Cy5
10	<i>E. coli</i>	U10248-1	Cy5
11	<i>K. oxytoca</i>	DSM 4798	Cy5
12	<i>K. oxytoca</i>	U10274	Cy5
13	<i>K. pneumoniae</i>	DSM 681	Cy3
14	<i>K. pneumoniae</i>	O3-390	Cy3
15	<i>K. pneumoniae</i>	O8-889	Cy3
16	<i>P. mirabilis</i>	DSM 788	Cy5
17	<i>P. mirabilis</i>	U10515	Cy5

18	<i>P. mirabilis</i>	U9979-1	Cy5
19	<i>P. vulgaris</i>	DSM 2140	Cy5
20	<i>C. albicans</i>	ATCC 10231	Cy3
21	<i>E. casseliflavus</i>	UW703/95	Cy5
22	<i>E. faecalis</i>	ATCC 29212	Cy5
23	<i>E. faecalis</i>	UW700/95	Cy5
24	<i>E. faecium</i>	VRE 9182	Cy3
25	<i>E. gallinarum</i>	UW701/97	Cy3
26	<i>S. agalactiae</i>	DSM 2134	Cy5
27	<i>S. angiosus</i>	DSM 20563	Cy3
28	<i>S. bovis</i>	DSM 20480	Cy3
29	<i>S. dysgalactiae</i>	DSM 20662	Cy3
30	<i>S. gordonii</i>	DSM 6777	Cy5
31	<i>S. mutans</i>	DSM 20523	Cy3
32	<i>S. pneumoniae</i>	ATCC 49619	Cy3
33	<i>S. pyogenes</i>	DSM 11723	Cy3
34	<i>S. aureus</i>	ATCC 29213	Cy3
35	<i>S. aureus</i>	P2716	Cy3
36	<i>S. aureus</i>	C5010	Cy3
37	<i>S. aureus</i>	MW2	Cy3
38	<i>S. epidermidis</i>	ATCC 12228	Cy5
39	<i>S. epidermidis</i>	BC 1920	Cy5
40	<i>S. haemolyticus</i>	DSM 20263	Cy5
41	<i>S. hominis</i>	DSM 20228	Cy5
42	<i>S. lugdunensis</i>	DSM 4804	CY3
43	<i>S. saprophyticus</i>	ATCC 14953	Cy3
44	<i>S. warneri</i>	DSM 20316	Cy5

Hybridization experiments with DNA obtained from the respective target strains revealed hybridization profiles specific for the different species and genera (Fig. 7). In contrast, non-target organisms hybridized nearly exclusively with 16S rRNA (Probe Nos. 1-24) and antibiotic gene probes (Probe Nos. 26-156) (Fig. 7 panels G and H).

Example 2.7: Specificity of hybridization profiles for fungi

DNA of the fungus *Candida albicans* hybridized specifically with the *Candida* gene probes (Probe Nos. 157-242) including *Candida* resistance probes but not with bacterial 16 rRNA or species specific probes (Fig. 8, panel A). The specificity of two selected *Candida* probes is demonstrated in Fig. 8 panel B, the probes *ALS1* and *ASL43f* hybridized only with DNA obtained from *C. albicans* and not with any DNA obtained from the 43 bacterial strains.

Example 2.8: Specificity of hybridization profiles for Gram-negative bacteria

Strains of the genus *Klebsiella* showed specific hybridization with the *Klebsiella* gene probes (Probe Nos. 399-469). For this genus cross hybridization with lower intensity of the fluorescent signals was observed with some *E. coli* and *P. aeruginosa* probes (Nos. 275-306 and 470-522, respectively). This is also the case for bacterial strains of the genus *Proteus*, which show major hybridization with the *Proteus* gene probes allowing unambiguous identification (Probe Nos. 523-601). Vice versa, *P. aeruginosa* and *E. coli* can be easily identified by their hybridization profiles, but show minor cross hybridization with gene probes of *Klebsiella*, *E. coli* and *P. aeruginosa*, respectively. The *E. coli* reference strain CIP 105893 and the clinical isolate U10164-2 show nearly identical hybridization profiles, demonstrating the high reproducibility of the assay. Strains of the non-fermenting Gram-negative bacterium *A. baumannii* were readily identified based on their microarray hybridization profile showing specific hybridization to the *A. baumannii* gene probes (Nos. 243-263). The specificity of selected species specific probes is shown in Figure 9. The *A. baumannii* probe *csuA* hybridized only with labelled DNA preparations derived from *A. baumannii* strain DSM 30008 and the clinical *A. baumannii* isolate but not with any other of the 42 strains. The *P. aeruginosa* probe *PhzA* showed hybridization signals with a high intensity >60000 (Median fluorescence – background) only with DNA of the *P. aeruginosa* reference strain but with no other pathogen, demonstrating that although some *P. aeruginosa* probes (eg. *aprA*) show cross-hybridization with other Gram-negative species, unambiguous identification is feasible. Equally specific results were obtained with the *E. coli* probe *shuA*, which showed significant hybridization signals > 40000 only with DNA of the seven *E. coli* reference strains and clinical isolates. The closely related species *K. oxytoca* and *K. pneumoniae* were easily identified and discriminated from each other by the *K. oxytoca* probe *tagK* and the *K. pneumoniae*

probe *acoC*. The *P. mirabilis* probe *hpmB* was highly specific for the three *P. mirabilis* strains and isolates, while probe *enzZPrvu* was specific for *P. vulgaris*.

Example 2.9: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Enterococcus*

The microarray assay was highly specific in the identification of Gram-positive target species. Clinical isolates of the species *E. faecalis* and *E. faecium* could be identified and discriminated unambiguously by their hybridization profiles (Probe Nos. 307-375 and 376-398, respectively) (Fig. 7, panels E and F). The vancomycin resistant non-target strain *E. casseliflavus* (Fig. 7, panel G) showed hybridization to the bacterial 16S rRNA probes, the antibiotic resistance gene probes *vanC-2* (vancomycin resistance), *arr2* (Rifampin resistance) and *tetM* (tetracycline resistance) and the *S. aureus* probes *gyrA* (DNA gyrase subunit A), *rpoB* (RNA polymerase B subunit) and *sstC* (iron transport protein) only. This profile does not permit species identification but indicates a vancomycin resistant bacterium. A similar profile was obtained for the vancomycin resistant non-target strain *E. gallinarum* (not shown).

Example 2.10: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Streptococcus*

Microarray hybridization assays performed with streptococcal DNA obtained from reference strains of *S. pneumoniae*, *S. pyogenes*, *S. mutans* and *S. agalactae* revealed species specific hybridization profiles and an excellent identification and discrimination of these target organisms (Fig. 7). The species *S. dysgalactiae* and *S. bovis* (*S. viridans* group) are each represented by a single gene probe on the array (*fasCAXStrdysg* and *lichStrbov*, respectively). These probes however exhibited specific hybridization to the target DNA only, and in this way permitted identification of the two species. Additionally both species showed hybridization with the 16S rRNA gene probes and *pbp2b* (penicillin binding protein of *S. pneumoniae*). Furthermore, *S. dysgalactiae* DNA hybridized with the probes *dacCStrpyog* and *murEStrpyog* and *S. bovis* DNA with *gyrA*, *rpoB* and *sstC* as *E. casseliflavus*. The non-target species *S. gordonii* and *S. angiosus* were readily discriminated by their hybridization profiles from other streptococci, *S. gordonii*

showed hybridization to the 16S rRNA genes only, *S. angiosus* DNA hybridized additionally to *gyrB* and *rpoB* (Fig. 7 H).

Example 2.11: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Staphylococcus*

Hybridization assays performed with *S. aureus* strains and *S. epidermidis* DNA produced very specific hybridization profiles with little cross hybridization (Fig. 7 AB). The specificity of selected probes for coagulase-negative staphylococci is shown in Fig. 10. *S. saprophyticus*, *S. haemolyticus*, *S. lugdunensis*, *S. warneri* and *S. hominis* produced hybridization profiles distinct of those from *S. aureus* and *S. epidermidis*. For these species the following species specific probes were detected: *RNAposigmSsapro_1* and *_2* for *S. saprophyticus*, *RNApolsigm* and *mvaDShaemolyt* for *S. haemolyticus*, *agrCStalugd*, *slamStalugd* and *fbIStalug* for *S. lugdunensis* and *proDStwar*, *gehASTwar* and *msrw1Stwar* for *S. warneri*. For *S. hominis* no probe proved to be species specific. The *S. hominis* derived probe *ydhK* cross hybridized with DNA of *S. hominis*, *S. epidermidis* and *S. haemolyticus*. However, certain probe patterns seem to be species specific for *S. hominis* and may allow identification and discrimination from *S. haemolyticus* and other CoNS (eg. hybridization of *ydhK*, *tnpStwar* and *sin* and absence of *mvaDShaemolyt* and *RNApolsigm*).

Example 2.12: Detection of antibiotic resistance determinants in Gram-negative bacteria

Susceptibility results determined by the VITEK2 system were compared to the results of the microarray hybridization assay for the simultaneous detection of antibiotic resistance genes.

For the Gram-negative enterobacteria *E. coli*, *K. pneumoniae*, *K. oxytoca*, *P. mirabilis* and *P. vulgaris* there was a 100% correlation between phenotypic resistance to aminoglycosides (Gentamycin, Tobramycin) and hybridization to at least one of the aminoglycoside gene probes *aacA4*, *aacC2*, *aadA*, *aacA* and *_aphDStwar* (Table 9).

Tab. 9: Aminoglycoside resistance of Gram-negative enterobacteria:

Strain	Aminoglycoside	Aminoglycoside
--------	----------------	----------------

	resistance phenotype ^a	resistance gene
<i>E. coli</i> CIP 105893	GENi, TOB	<i>aacA4</i> , <i>aadA</i>
<i>E. coli</i> ATCC 25922	susceptible	-
<i>E. coli</i> CIP 81.88	susceptible	-
<i>E. coli</i> CIP 74.14	STR	-
<i>E. coli</i> U10338-1	GENi, TOB	<i>aacA4</i>
<i>E. coli</i> U10164-2	GEN, TOB	<i>aacC2</i>
<i>E. coli</i> U10248-1	GEN, TOB	<i>aacC2</i> , <i>strB</i>
<i>K. oxytoca</i> DSM 4798	susceptible	-
<i>K. oxytoca</i> U10274	susceptible	-
<i>K. pneumoniae</i> DSM 681	susceptible	-
<i>K. pneumoniae</i> 390	susceptible	-
<i>K. pneumoniae</i> 889	susceptible	<i>strB</i>
<i>P. mirabilis</i> DSM 788	susceptible	-
<i>P. mirabilis</i> U10515	susceptible	<i>aacC1</i>
<i>P. mirabilis</i> U9979-1	GEN, TOB	<i>aacC2</i> , <i>aadA</i> , <i>aacA_aphDStwar</i> , <i>strB</i>
<i>P. vulgaris</i> DSM 2140	susceptible	-

^aGEN Gentamycin; TOB tobramycin; STR Streptomycin, resistance was not tested routinely; i, intermediary resistance

All enterobacterial strains which showed resistance to β -lactam antibiotics (penicillin and cephalosporines) hybridized with at least one or more β -lactamase gene probes (*bla*CTX-M, *bla*FOX-3 and -6, *bla*PRMI, *bla*TEM, *bla*SHV, *bla*OXY-KLOX, *bla*A) (Table 10). There was no hybridization with the resistance gene probes *ampC* and *bla*OXA with any of the tested strains.

10 Tab. 10: β -lactam resistance of Gram-negative enterobacteria:

Strain	β -lactam resistance phenotype ^a	β -lactamase genotype ^b
<i>E. coli</i> CIP 105893	ESBL	<i>bla</i> CTX-M-22, <i>bla</i> FOX-3, <i>bla</i> FOX-6, <i>bla</i> PRMI, <i>bla</i> TEM
<i>E. coli</i> ATCC 25922	susceptible	-
<i>E. coli</i> CIP 81.88	susceptible	-
<i>E. coli</i> CIP 74.14	susceptible	-
<i>E. coli</i> U10338-1	ESBL	<i>bla</i> CTX-M-22, <i>bla</i> TEM

<i>E. coli</i> U10164-2	ESBL	blaCTX-M-22, blaOXY, blaPRMI, blaTEM
<i>E. coli</i> U10248-1	AMP, ASU, MEZ, PRLi, TZPi, CXM	blaCTX-M-22, blaPRMI, blaSHV, blaTEM
<i>K. oxytoca</i> DSM 4798	AMP, ASUi, MEZi	blaOXY
<i>K. oxytoca</i> U10274	ESBL	blaCTX-M-22, blaOXY, blaOXY-KLOX, blaSHV
<i>K. pneumoniae</i> DSM 681	AMP, ASUi, MEZi, PRLi	blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaSHV
<i>K. pneumoniae</i> 390	AMP, ASUi, MEZi	blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaOXY-KLOX, blaSHV
<i>K. pneumoniae</i> 889	AMPi	blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY-KLOX, blaSHV
<i>P. mirabilis</i> DSM 788	KZi, CXMi, IMP	-
<i>P. mirabilis</i> U10515	ESBL, IMP	blaCTX-M-22,
<i>P. mirabilis</i> U9979-1	ESBL, IMP	blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaPRMI, blaTEM
<i>P. vulgaris</i> DSM 2140	AMP, KZ	blaA ^d

^aESBL extended spectrum β -lactamases; AMP, Ampicillin; ASU, Ampicillin/Sublactam; MEZ, Mezlocillin; PRL, Piperacillin; KZ, Cefazolin; CXM, Cefuroxim; IMP, Imipenem; i, intermediary resistance

^bFluorescence signals ≥ 10000 were considered positive.

5 ^cFluorescence < 10000 ; most fluorescence signals were < 30000 for the hybridization assay with *P. vulgaris* DMS 2140

10 Strains susceptible to β -lactam antibiotics did not show significant hybridization signals (Median fluorescence – background < 10000) with any of the β -lactamase gene probes. Although the hybridization pattern permitted the detection of different types of β -lactamases (*blaTEM*, *blaSHV*, *blaCTX-M*, *blaFOX*), it did, however, not allow the detection and discrimination of extended spectrum β -lactamases (ESBL). For the two clinical isolates of *P. mirabilis* the ESBL phenotype was correlated with hybridization of the *acrA*, *-B* and *-R* genes, which encode a multidrug efflux pump.

15 Furthermore, for these two species, resistance to tetracycline was correlated with hybridization of the *P. mirabilis* derived gene probe *tetA*J.

Example 2.13: Detection of antibiotic resistance determinants in Gram-positive bacteria

The phenotypic vancomycin resistance of the tested enterococci correlated by 100% with the genotypic resistance determined by microarray hybridization (Table 11).

Tab. 11: Phenotypic and genotypic resistance of *Enterococcus* strains.

Strain	Resistance phenotype ^a	Resistance genotype				
		Aminoglycosides	Glycopeptides	Macrolides	Tetracycline	Efflux pumps
<i>E. casseliflavus</i> UW703/95	VAN, DA, QDi	-	<i>vanC</i>	-	<i>tetM</i>	-
<i>E. faecalis</i> ATCC 29212	DA, Ei, QD, TET, SXT	-	-	-	<i>tetM</i>	<i>emeA</i>
<i>E. faecalis</i> UW700/95	VAN, DA, E, GEN, QD, STR, SXT	<i>aacA-aphD</i>	<i>vanB</i>	<i>ermB</i>	-	<i>emeA^b</i>
<i>E. faecium</i> VRE9182	VAN, AMPi, DA, E, QDi, STR, Teicoplanin, TET	<i>aphA3^b</i>	<i>vanA, vanB</i>	<i>ermB</i>	<i>tetL, tetM</i>	<i>msrCb</i>
<i>E. gallinarum</i> UW701/97	VAN, DA, QDi, SXT, TET	-	<i>vanC</i>	-	<i>tetM</i>	-

^aVAN, vancomycin; DA, clindamycin; E, erythromycin; QD, quinupristin/dalfopristin (streptogramins); STR, streptomycin, TET, tetracycline; i, intermediary resistance.

^bRelative low fluorescence intensity (Median fluorescence – background <18.000).

Hybridization to the *vanC-2* gene was observed for the two vancomycin resistant strains *E. casseliflavus* and *E. gallinarum*, which contain the *vanC-2* and the *vanC-1* gene, respectively. The *vanB* gene was detected in the clinical isolates of *E. faecalis* UW700/95 and *E. faecium* VRE9182, the latter strain also hybridized with the *vanA* gene, indicating the presence of both genes. Furthermore, these two strains showed hybridization with aminoglycoside resistance genes (*aacA-aphD* and *aphA3*, respectively) and the macrolide resistance gene *ermB* (Table 11). The presence of efflux pumps involved in macrolide resistance was indicated by microarray hybridization for both *E. faecalis* strains (*emeA*) and *E. faecium* VRE9182 (*msrCb*).

Genotypic resistance to tetracycline was detected for four of the five strains (hybridization to *tetL* and/or *tetM*).

The tested streptococci showed phenotypic susceptibility to all tested antibiotics.

- 5 For staphylococci, there was 100% correlation between phenotypic resistance to penicillin and hybridization of the *blaZ* and the *blaIShaemolyt* gene probes and between oxacillin resistance and hybridization to the *mecA* gene (Table 12).

Tab. 12: Phenotypic and genotypic resistance of *Staphylococcus* strains.

Strain	Resistance phenotype ^a	Resistance genotype			
		Aminoglycosides	β-lactams	Macrolides	Efflux pumps
<i>S. aureus</i> ATCC 29213	PEN	-	<i>blaZ</i> , <i>blaIShaemolyt</i>	-	<i>msrA</i> , <i>mreA</i>
<i>S. aureus</i> P2116	PEN, Ei, DAi,	-	<i>blaZ</i> , <i>blaIShaemolyt</i>	-	<i>msrA</i> , <i>mreA</i>
<i>S. aureus</i> C5010	TOB, PEN, OXA, E, DA	<i>aadD</i>	<i>blaZ</i> , <i>blaIShaemolyt</i> , <i>mecA</i>	<i>ermA</i>	<i>msrA</i> , <i>mreA</i>
<i>S. aureus</i> MW2	PEN, OXA, Trimethoprim	-		-	<i>msrA</i> , <i>mreA</i>
<i>S. epidermidis</i> ATCC 12228	PEN	-	<i>blaZ</i> , <i>blaIShaemolyt</i>	-	-
<i>S. epidermidis</i> BC1920	GEN, TOB, PEN, OXA, E, DA	<i>aadD</i> , <i>aacA-aphD</i> , <i>aacA_aphDStwar</i>	<i>blaZ</i> , <i>blaIShaemolyt</i> , <i>mecA</i>	<i>ermC</i>	-
<i>S. haemolyticus</i> DSM 20263	susceptible	-	-	-	-
<i>S. hominis</i> DSM 20228	susceptible	-	-	-	-
<i>S. lugdunensis</i> DSM 4804	susceptible	-	-	-	-
<i>S. saprophyticus</i> ATCC 14953	susceptible	-	-	-	-
<i>S. warneri</i> DSM 20316	susceptible	-	-	-	-

^aPEN, penicillin; OXA, oxacillin; DA, clindamycin; E, erythromycin; TOB, tobramycin; GEN, gentamicin; i, intermediary resistance.

^bRelative low fluorescence intensity (Median fluorescence – background <18.000).

Resistance to macrolides (erythromycin and clindamycin) was conferred by the *ermA* gene to the clinical MRSA isolate C5010 and by *ermC* to the MRSE isolate

BC1920. Both strains also showed resistance to tobramycin, which was conferred by the *aadD* gene, additionally the *S. epidermidis* isolate was resistant to gentamycin, due to possession of the *aacA-aphD* gene (Table 12). With the exception of the *S. epidermidis* strains, all CoNS showed a susceptible phenotype and did not hybridize with any of the resistance gene probes.

Example 2.14: Strain discrimination and detection of virulence genes in *S. aureus*

Virulence gene probes, showing varying fluorescence intensities after hybridization with DNA of four different *S. aureus* strains are listed in Table 13.

Tab. 13: Hybridization of *S. aureus* virulence gene probes: -, Median fluorescence <10000; +, Median fluorescence ≥10000-20000; ++, Median fluorescence >20000-50000; +++, Median fluorescence <50000. Percentage of identity for gene probe sequences complementary to the genes present in the fully sequenced strain MW2 is given in the last column.

<i>S. aureus</i> virulence gene probes	<i>S. aureus</i> ATCC 29213	<i>S. aureus</i> P2116	MRSA C5010	MRSA MW2	Sequence identity with MW2 genome sequence
<i>epiP-bsaP</i>	-	-	-	+++	100%
<i>hsdS1</i>	+++	-	+++	-	Not present
<i>SAV0441</i>	+++	-	+++	+	Not present
<i>bsaE</i>	-	-	+	+++	100%
<i>bsaG</i>	++	++	+++	+++	100%
<i>cap5</i>	+++	-	+++	-	Not present
<i>cap8</i>	-	+++	-	+++	100%
<i>EDIN</i>	+++	-	-	-	Not present -
<i>lukF</i>	+	++	++	+++	95%
<i>lukS1</i>	+	+	++	+++	98%
<i>sea</i>	+++	-	+++	+++	100%
<i>sec1</i>	-	-	+	+++	98%
<i>seg1</i>	+++	-	+++	+	Not present

<i>seh</i>	-	+	++	+++	100%
<i>sel</i>	-	-	+	+++	99%

For other *S. aureus* gene probes the fluorescence intensities were either very low (MF-B <10000) for all four strains indicating the absence of the according gene (eg. *tst*, *eta* or *etb*) or very high (MF-B >50000), indicating the presence of the according gene in all four strains (eg. *hglA*, *hglB*, *hglC*, *NAG*, *sak*, *set*, *sprV8*). Capsular polysaccharides enhance microbial virulence by rendering the bacterium resistant to phagocytosis. Among the eleven capsular serotypes of *S. aureus*, serotypes 5 and 8 account for $\approx 25\%$ and 50% , respectively, of isolates recovered from humans. Moreover, these two serotypes, carrying the genes *cap5* and *cap8*, are prevalent among isolates from clinical infections as well as from commensal sources. By microarray hybridization the *cap5* gene was detected in the ATCC 29213 strain and the clinical MRSA isolate C5010, while *cap8* was detected in the clinical isolate P2116 and the community-acquired MRSA strain MW2 (Table 13). The latter strain hybridized to many virulence gene probes including the leukocidin gene probes *lukF* and *lukS* and the enterotoxin gene probes *sea*, *sec*, *seh* and *sel*. This microarray gene profile is in perfect concordance with genome sequence of this fully sequenced strain, which produces the Panton-Valentine leukocidin (PVL), encoded by *lukF* and *lukS*. Panton-Valentine leukocidin forms non-specific pores in leukocyte plasma membranes, which result in increased permeability and eventual host cell lysis. While strain MW2 does not harbor the gene *seg* encoding enterotoxin G, this gene was detected in the ATCC strain and the clinical MRSA isolate C5010, which both also showed hybridization with *sea* (Enterotoxin A). In contrast, the clinical isolate P2116 showed no or only minor hybridization with these virulence probes. From these results it can be concluded that microarray hybridization patterns allow the discrimination of different *S. aureus* strains as well as the detection of clinically relevant virulence determinants.

Example 2.15: Strain discrimination and detection of virulence genes in *E. coli*

Virulence gene probes, showing varying fluorescence intensities after hybridization with DNA of seven different *E. coli* strains are listed in Table 14.

Tab. 14: Hybridization of *E. coli* virulence gene probes: -, Median fluorescence <10000; +, Median fluorescence ≥10000 -20000; ++, Median fluorescence >20000-50000; +++, Median fluorescence <50000.

	<i>E. coli</i> CIP 105893 ESBL	<i>E. coli</i> ATCC 25922	<i>E. coli</i> CIP 81.88	<i>E. coli</i> CIP 74.14	<i>E. coli</i> U10338-1 ESBL	<i>E. coli</i> U10164-2 ESBL, GEN-R	<i>E. coli</i> U10248-1 GEN-R
<i>b1169</i>	+++	++	+++	++	+++	+++	-
<i>ycdS</i>	+++	++	+++	++	+++	+++	-
<i>ymcA</i>	+++	+	+++	-	-	+	+
<i>b1202</i>	+++	-	+++	-	-	-	+++
<i>fteA</i>	+	+	-	++	+++	+++	++
<i>iucA</i>	+	++	-	-	+++	+++	+++
<i>iucB</i>	-	++	-	-	++	+++	++
<i>iucC</i>	+	++	-	-	+++	+++	+++
<i>papG</i>	-	+++	-	++	-	-	+++

5

10

None of the listed genes was detected in all seven strains. Major hybridization of the *iuc* aerobactin synthesis genes was detected for four strains. The genes *fteA* (allele of *papA*) and *papG*, both involved in adhesion to host cells and virulence in urinary tract infections were detected in five strains. The three clinical isolates U10338-1, U10164-2 and U10248-1 were all isolated from patients with urinary tract infections. Based on the virulence hybridization pattern, strains U10338-1 and U10164-2 are nearly identical, while strain U10248-1 can be clearly discriminated.

Sequence Listing – Free text**a) Probe sequences**

SEQ ID NO	Probe name	Template source
1	cataSaur_1_1	<i>Staphylococcus aureus</i>
2	cataSaur_1_2	<i>Staphylococcus aureus</i>
3	clfA_1_1	<i>Staphylococcus aureus</i>
4	clfB_1_1	<i>Staphylococcus aureus</i>
5	coa_1_1	<i>Staphylococcus aureus</i>
6	coa_1_2	<i>Staphylococcus aureus</i>
7	I-clpC_1_1	<i>Staphylococcus aureus</i>
8	I-clpP_1_1	<i>Staphylococcus aureus</i>
9	I-ctaA_1_1	<i>Staphylococcus aureus</i>
10	I-ctsR_1_1	<i>Staphylococcus aureus</i>
11	I-dltA_1_1	<i>Staphylococcus aureus</i>
12	I-dltB_1_1	<i>Staphylococcus aureus</i>
13	I-dltC_1_1	<i>Staphylococcus aureus</i>
14	I-dnaK_1_1	<i>Staphylococcus aureus</i>
15	I-elkT_1_1	<i>Staphylococcus aureus</i>
16	I-femD_1_1	<i>Staphylococcus aureus</i>
17	I-glnA_1_1	<i>Staphylococcus aureus</i>
18	I-glnR_1_1	<i>Staphylococcus aureus</i>
19	I-grlA_1_1	<i>Staphylococcus aureus</i>
20	I-grlB_1_1	<i>Staphylococcus aureus</i>
21	I-groEL_1_1	<i>Staphylococcus aureus</i>
22	I-groES_1_1	<i>Staphylococcus aureus</i>
23	I-hemA_1_1	<i>Staphylococcus aureus</i>
24	I-hemE_1_1	<i>Staphylococcus aureus</i>
25	I-hemH_1_1	<i>Staphylococcus aureus</i>
26	I-hemL_1_1	<i>Staphylococcus aureus</i>
27	I-hemY_1_1	<i>Staphylococcus aureus</i>
28	I-lepA_1_1	<i>Staphylococcus aureus</i>
29	I-lrgA_1_1	<i>Staphylococcus aureus</i>
30	I-lrgB_1_1	<i>Staphylococcus aureus</i>
31	I-lytM_1_1	<i>Staphylococcus aureus</i>
32	I-menB_1_1	<i>Staphylococcus aureus</i>
33	I-menD_1_1	<i>Staphylococcus aureus</i>
34	I-menE_1_1	<i>Staphylococcus aureus</i>
35	I-menF_1_1	<i>Staphylococcus aureus</i>
36	I-mreB_1_1	<i>Staphylococcus aureus</i>
37	I-mreR_1_1	<i>Staphylococcus aureus</i>
38	I-mutL_1_1	<i>Staphylococcus aureus</i>
39	I-mutS_1_1	<i>Staphylococcus aureus</i>
40	I-NAG_1_1	<i>Staphylococcus aureus</i>
41	I-pbg_1_1	<i>Staphylococcus aureus</i>
42	I-pbpF_1_1	<i>Staphylococcus aureus</i>
43	I-pdhB_1_1	<i>Staphylococcus aureus</i>

SEQ ID NO	Probe name	Template source
44	I-pdhC_1_1	<i>Staphylococcus aureus</i>
45	I-rsbU_1_1	<i>Staphylococcus aureus</i>
46	I-rsbV_1_1	<i>Staphylococcus aureus</i>
47	I-rsbW_1_1	<i>Staphylococcus aureus</i>
48	I-sgp_1_1	<i>Staphylococcus aureus</i>
49	I-sirR_1_1	<i>Staphylococcus aureus</i>
50	I-sodA_1_1	<i>Staphylococcus aureus</i>
51	I-sodB_1_1	<i>Staphylococcus aureus</i>
52	I-sstA_1_1	<i>Staphylococcus aureus</i>
53	I-sstB_1_1	<i>Staphylococcus aureus</i>
54	I-sstC_1_1	<i>Staphylococcus aureus</i>
55	I-sstD_1_1	<i>Staphylococcus aureus</i>
56	I-trx_1_1	<i>Staphylococcus aureus</i>
57	I-yhiN_1_1	<i>Staphylococcus aureus</i>
58	epiP-bsaP_1_1	<i>Staphylococcus aureus</i>
59	geh_1_1	<i>Staphylococcus aureus</i>
60	gyrA_1_1	<i>Staphylococcus aureus</i>
61	gyrB_1_1	<i>Staphylococcus aureus</i>
62	hemB_1_1	<i>Staphylococcus aureus</i>
63	hemC_1_1	<i>Staphylococcus aureus</i>
64	hemD_1_1	<i>Staphylococcus aureus</i>
65	hemN_1_1	<i>Staphylococcus aureus</i>
66	hsdS_1_1	<i>Staphylococcus aureus</i>
67	hsdS_2_1	<i>Staphylococcus aureus</i>
68	lip_1_1	<i>Staphylococcus aureus</i>
69	menC_1_1	<i>Staphylococcus aureus</i>
70	murC_1_1	<i>Staphylococcus aureus</i>
71	nuc_1_1	<i>Staphylococcus aureus</i>
72	pdhD_1_1	<i>Staphylococcus aureus</i>
73	rpoB_1_1	<i>Staphylococcus aureus</i>
74	SAV0431_1_1	<i>Staphylococcus aureus</i>
75	SAV0439_1_1	<i>Staphylococcus aureus</i>
76	SAV0440_1_1	<i>Staphylococcus aureus</i>
77	SAV0441_1_1	<i>Staphylococcus aureus</i>
78	sigB_1_1	<i>Staphylococcus aureus</i>
79	spa_1_2	<i>Staphylococcus aureus</i>
80	sstC_1_1	<i>Staphylococcus aureus</i>
81	tag_1_1	<i>Staphylococcus aureus</i>
82	tyrA_1_1	<i>Staphylococcus aureus</i>
83	I-aroC_1_1	<i>Staphylococcus aureus</i>
84	I-aroA_1_1	<i>Staphylococcus aureus</i>
85	I-cna_1_1	<i>Staphylococcus aureus</i>
86	I-ebpS_1_1	<i>Staphylococcus aureus</i>
87	I-eno_1_1	<i>Staphylococcus aureus</i>
88	I-fbpA_1_1	<i>Staphylococcus aureus</i>
89	I-fib_1_1	<i>Staphylococcus aureus</i>

SEQ ID NO	Probe name	Template source
90	I-fnbB_1_1	<i>Staphylococcus aureus</i>
91	I-srtA_1_1	<i>Staphylococcus aureus</i>
92	I-stpC_1_1	<i>Staphylococcus aureus</i>
93	I-fnbA_1_1	<i>Staphylococcus aureus</i>
94	I-spa_1_1	<i>Staphylococcus aureus</i>
95	I-aroE_1_1	<i>Staphylococcus aureus</i>
96	I-aroF_1_1	<i>Staphylococcus aureus</i>
97	I-aroG_1_1	<i>Staphylococcus aureus</i>
98	I-asp23_1_1	<i>Staphylococcus aureus</i>
99	I-atl_1_1	<i>Staphylococcus aureus</i>
100	bsaE_1_1	<i>Staphylococcus aureus</i>
101	bsaG_1_1	<i>Staphylococcus aureus</i>
102	cap5h_1_1	<i>Staphylococcus aureus</i>
103	cap5i_1_1	<i>Staphylococcus aureus</i>
104	cap5j_1_1	<i>Staphylococcus aureus</i>
105	cap5k_1_1	<i>Staphylococcus aureus</i>
106	cap8H_1_1	<i>Staphylococcus aureus</i>
107	cap8I_1_1	<i>Staphylococcus aureus</i>
108	cap8J_1_1	<i>Staphylococcus aureus</i>
109	cap8K_1_1	<i>Staphylococcus aureus</i>
110	I-hld_1_1	<i>Staphylococcus aureus</i>
111	I-hysA_1_1	<i>Staphylococcus aureus</i>
112	I-IgGbg_1_1	<i>Staphylococcus aureus</i>
113	EDIN_1_1	<i>Staphylococcus aureus</i>
114	eta_1_1	<i>Staphylococcus aureus</i>
115	etb_1_1	<i>Staphylococcus aureus</i>
116	hglA_1_1	<i>Staphylococcus aureus</i>
117	hglA_2_1	<i>Staphylococcus aureus</i>
118	hglB_1_1	<i>Staphylococcus aureus</i>
119	hglC_2_1	<i>Staphylococcus aureus</i>
120	hla_1_1	<i>Staphylococcus aureus</i>
121	hlb_1_2	<i>Staphylococcus aureus</i>
122	lukF_1_1	<i>Staphylococcus aureus</i>
123	lukS_1_1	<i>Staphylococcus aureus</i>
124	lukS_2_1	<i>Staphylococcus aureus</i>
125	NAG_1_1	<i>Staphylococcus aureus</i>
126	sak_1_1	<i>Staphylococcus aureus</i>
127	sea_1_1	<i>Staphylococcus aureus</i>
128	seb_1_1	<i>Staphylococcus aureus</i>
129	sec1_1_1	<i>Staphylococcus aureus</i>
130	seg_1_1	<i>Staphylococcus aureus</i>
131	seh_1_1	<i>Staphylococcus aureus</i>
132	sel_1_1	<i>Staphylococcus aureus</i>
133	set15_1_1	<i>Staphylococcus aureus</i>
134	set6_1_1	<i>Staphylococcus aureus</i>
135	set7_1_1	<i>Staphylococcus aureus</i>

SEQ ID NO	Probe name	Template source
136	set8_1_1	<i>Staphylococcus aureus</i>
137	sprV8_1_1	<i>Staphylococcus aureus</i>
138	tst_1_1	<i>Staphylococcus aureus</i>
139	I-sdrC_1_1	<i>Staphylococcus aureus</i>
140	I-sdrD_1_1	<i>Staphylococcus aureus</i>
141	I-sdrE_1_1	<i>Staphylococcus aureus</i>
142	b1169_1_1	<i>Escherichia coli</i>
143	envZ_1_1	<i>Escherichia coli</i>
144	fliCb_1_1	<i>Escherichia coli</i>
145	nfrB_1_1	<i>Escherichia coli</i>
146	nlpA_1_1	<i>Escherichia coli</i>
147	pilAe_1_1	<i>Escherichia coli</i>
148	yacH_1_1	<i>Escherichia coli</i>
149	yagX_1_1	<i>Escherichia coli</i>
150	ycdS_1_1	<i>Escherichia coli</i>
151	yciQ_1_1	<i>Escherichia coli</i>
152	ymcA_1_1	<i>Escherichia coli</i>
153	b1202_1_1	<i>Escherichia coli</i>
154	eae_1_1	<i>Escherichia coli</i>
155	eltB_1_1	<i>Escherichia coli</i>
156	escR_1_1	<i>Escherichia coli</i>
157	escT_1_1	<i>Escherichia coli</i>
158	escU_1_1	<i>Escherichia coli</i>
159	espB_1_1	<i>Escherichia coli</i>
160	fes_1_1	<i>Escherichia coli</i>
161	fes_2_1	<i>Escherichia coli</i>
162	fteA_1_1	<i>Escherichia coli</i>
163	hlyA_1_1	<i>Escherichia coli</i>
164	hlyB_1_1	<i>Escherichia coli</i>
165	iucA_1_1	<i>Escherichia coli</i>
166	iucB_1_1	<i>Escherichia coli</i>
167	iucC_1_1	<i>Escherichia coli</i>
168	papG_1_1	<i>Escherichia coli</i>
169	rfbE_1_1	<i>Escherichia coli</i>
170	shuA_1_1	<i>Escherichia coli</i>
171	SLTII_1_1	<i>Escherichia coli</i>
172	toxA-LTPA_1_1	<i>Escherichia coli</i>
173	VT2vaB_1_1	<i>Escherichia coli</i>
174	ardeSE0106_1_1	<i>Staphylococcus epidermidis</i>
175	ardeSE0107_1_1	<i>Staphylococcus epidermidis</i>
176	aroI SE0105_1_1	<i>Staphylococcus epidermidis</i>
177	atIE_1_1	<i>Staphylococcus epidermidis</i>
178	agrB_1_1	<i>Staphylococcus epidermidis</i>
179	agrC_1_1	<i>Staphylococcus epidermidis</i>
180	alphSE1368_1_1	<i>Staphylococcus epidermidis</i>
181	gad_1_1	<i>Staphylococcus epidermidis</i>

SEQ ID NO	Probe name	Template source
182	glucSE1191_1_1	<i>Staphylococcus epidermidis</i>
183	hsp10_1_1	<i>Staphylococcus epidermidis</i>
184	icaA_1_1	<i>Staphylococcus epidermidis</i>
185	icaB_1_1	<i>Staphylococcus epidermidis</i>
186	mvaSSepid_1_1	<i>Staphylococcus epidermidis</i>
187	nitreSE1972_1_1	<i>Staphylococcus epidermidis</i>
188	nitreSE1974_1_1	<i>Staphylococcus epidermidis</i>
189	nitreSE1975_1_1	<i>Staphylococcus epidermidis</i>
190	oiamtSE1209_1_1	<i>Staphylococcus epidermidis</i>
191	ORF1Sepid_1_1	<i>Staphylococcus epidermidis</i>
192	ORF3bSepid_1_1	<i>Staphylococcus epidermidis</i>
193	qacR_1_1	<i>Staphylococcus epidermidis</i>
194	sin_1_1	<i>Staphylococcus epidermidis</i>
195	ureSE1861_1_1	<i>Staphylococcus epidermidis</i>
196	ureSE1863_1_1	<i>Staphylococcus epidermidis</i>
197	ureSE1864_1_1	<i>Staphylococcus epidermidis</i>
198	ureSE1865_1_1	<i>Staphylococcus epidermidis</i>
199	ureSE1867_1_1	<i>Staphylococcus epidermidis</i>
200	gcaD_1_1	<i>Staphylococcus epidermidis</i>
201	hld_orf5_1_1	<i>Staphylococcus epidermidis</i>
202	icaC_1_1	<i>Staphylococcus epidermidis</i>
203	icaD_1_1	<i>Staphylococcus epidermidis</i>
204	icaR_1_1	<i>Staphylococcus epidermidis</i>
205	psm_beta1and2_1_1	<i>Staphylococcus epidermidis</i>
206	purR_1_1	<i>Staphylococcus epidermidis</i>
207	spoVG_1_1	<i>Staphylococcus epidermidis</i>
208	yabJ_1_1	<i>Staphylococcus epidermidis</i>
209	folQShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
210	mvaCShaemolyticus_1_1	<i>Staphylococcus haemolyticus</i>
211	mvaDShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
212	mvaK1Shaemolyticus_1_1	<i>Staphylococcus haemolyticus</i>
213	mvaSShaemolyticus_1_1	<i>Staphylococcus haemolyticus</i>
214	RNApolsigm_1_1	<i>Staphylococcus haemolyticus</i>
215	lipShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
216	agrB2Stalugd_1_1	<i>Staphylococcus lugdunensis</i>
217	agrC2Stalugd_1_1	<i>Staphylococcus lugdunensis</i>
218	agrCStalugd_1_1	<i>Staphylococcus lugdunensis</i>
219	slamStalugd_1_1	<i>Staphylococcus lugdunensis</i>
220	fblStalugd_1_1	<i>Staphylococcus lugdunensis</i>
221	slushABCStalugd_1_1	<i>Staphylococcus lugdunensis</i>
222	RNApolsigmSsapro_1_1	<i>Staphylococcus saprophyticus</i>
223	RNApolsigmSsapro_1_2	<i>Staphylococcus saprophyticus</i>
224	msrw1Stwar_1_1	<i>Staphylococcus warneri</i>
225	nukMStwar_1_1	<i>Staphylococcus warneri</i>
226	proDStwar_1_1	<i>Staphylococcus warneri</i>
227	proMStwar_1_1	<i>Staphylococcus warneri</i>

SEQ ID NO	Probe name	Template source
228	sigrpoStwar_1_1	<i>Staphylococcus warneri</i>
229	tnpStwar_1_1	<i>Staphylococcus warneri</i>
230	gehASTwar_1_1	<i>Staphylococcus warneri</i>
231	ARG56_1_1	<i>Candida albicans</i>
232	ASL43f_1_1	<i>Candida albicans</i>
233	BGL2_1_1	<i>Candida albicans</i>
234	CACHS3_1_1	<i>Candida albicans</i>
235	CCT8_1_1	<i>Candida albicans</i>
236	CDC37_1_1	<i>Candida albicans</i>
237	CEF3_1_1	<i>Candida albicans</i>
238	CHS1_1_1	<i>Candida albicans</i>
239	CHS2_1_1	<i>Candida albicans</i>
240	CHS4_1_1	<i>Candida albicans</i>
241	CHS5_1_1	<i>Candida albicans</i>
242	CHT1_1_1	<i>Candida albicans</i>
243	CHT2_1_1	<i>Candida albicans</i>
244	CHT4_1_1	<i>Candida albicans</i>
245	CSA1_1_1	<i>Candida albicans</i>
246	5triphosphatase_1_1	<i>Candida albicans</i>
247	AAF1_1_1	<i>Candida albicans</i>
248	ADH1_1_1	<i>Candida albicans</i>
249	ALS1_1_1	<i>Candida albicans</i>
250	ALS7_1_1	<i>Candida albicans</i>
251	EDT1_1_1	<i>Candida albicans</i>
252	ELF_1_1	<i>Candida albicans</i>
253	ESS1_1_1	<i>Candida albicans</i>
254	FAL1_1_1	<i>Candida albicans</i>
255	GAP1_1_1	<i>Candida albicans</i>
256	GNA1_1_1	<i>Candida albicans</i>
257	GSC1_1_1	<i>Candida albicans</i>
258	GSL1_1_1	<i>Candida albicans</i>
259	HIS1_1_1	<i>Candida albicans</i>
260	HTS1_1_1	<i>Candida albicans</i>
261	HWP1_2_1	<i>Candida albicans</i>
262	HYR1_1_1	<i>Candida albicans</i>
263	INT1a_1_1	<i>Candida albicans</i>
264	KRE15f_1_1	<i>Candida albicans</i>
265	KRE6_1_1	<i>Candida albicans</i>
266	KRE9_1_1	<i>Candida albicans</i>
267	MIG1_1_1	<i>Candida albicans</i>
268	MLS1_1_1	<i>Candida albicans</i>
269	MP65_1_1	<i>Candida albicans</i>
270	NDE1_1_1	<i>Candida albicans</i>
271	PFK2_1_1	<i>Candida albicans</i>
272	PHR1_1_1	<i>Candida albicans</i>
273	PHR2_1_1	<i>Candida albicans</i>

SEQ ID NO	Probe name	Template source
274	PHR3_1_1	<i>Candida albicans</i>
275	PRA1_1_1	<i>Candida albicans</i>
276	PRS1_1_1	<i>Candida albicans</i>
277	RBT1_1_1	<i>Candida albicans</i>
278	RBT4_1_1	<i>Candida albicans</i>
279	RHO1_1_1	<i>Candida albicans</i>
280	RNR1_1_1	<i>Candida albicans</i>
281	RPB7_1_1	<i>Candida albicans</i>
282	RPL13_1_1	<i>Candida albicans</i>
283	RVS167_1_1	<i>Candida albicans</i>
284	SHA3_1_1	<i>Candida albicans</i>
285	SKN1_1_1	<i>Candida albicans</i>
286	SRB1_1_1	<i>Candida albicans</i>
287	TCA1_1_1	<i>Candida albicans</i>
288	TRP1_1_1	<i>Candida albicans</i>
289	YAE1_1_1	<i>Candida albicans</i>
290	YRB1_1_1	<i>Candida albicans</i>
291	YST1exon2_1_1	<i>Candida albicans</i>
292	CCN1_1_1	<i>Candida albicans</i>
293	CDC28_1_1	<i>Candida albicans</i>
294	CLN2_1_1	<i>Candida albicans</i>
295	CPH1_1_1	<i>Candida albicans</i>
296	CYB1_1_1	<i>Candida albicans</i>
297	EFG1_1_1	<i>Candida albicans</i>
298	MNT1_1_1	<i>Candida albicans</i>
299	RBF1_1_1	<i>Candida albicans</i>
300	RBF1_2_1	<i>Candida albicans</i>
301	RIM101_1_1	<i>Candida albicans</i>
302	RIM8_1_1	<i>Candida albicans</i>
303	SEC14_1_1	<i>Candida albicans</i>
304	SEC4_1_1	<i>Candida albicans</i>
305	TUP1_1_1	<i>Candida albicans</i>
306	YPT1_1_1	<i>Candida albicans</i>
307	ZNF1CZF1_2_1	<i>Candida albicans</i>
308	arcA_1_1	<i>Enterococcus faecalis</i>
309	arcC_1_1	<i>Enterococcus faecalis</i>
310	bkdA_1_1	<i>Enterococcus faecalis</i>
311	cad_1_1	<i>Enterococcus faecalis</i>
312	camE1_1_1	<i>Enterococcus faecalis</i>
313	csrA_1_1	<i>Enterococcus faecalis</i>
314	dacA_1_1	<i>Enterococcus faecalis</i>
315	dfr_1_1	<i>Enterococcus faecalis</i>
316	dhoD1a_1_1	<i>Enterococcus faecalis</i>
317	ABC-eltA_1_1	<i>Enterococcus faecalis</i>
318	agrBfs_1_1	<i>Enterococcus faecalis</i>
319	agrCfs_1_1	<i>Enterococcus faecalis</i>

SEQ ID NO	Probe name	Template source
320	dnaE_1_1	<i>Enterococcus faecalis</i>
321	ebsA_1_1	<i>Enterococcus faecalis</i>
322	ebsB_1_1	<i>Enterococcus faecalis</i>
323	eep_1_1	<i>Enterococcus faecalis</i>
324	efaR_1_1	<i>Enterococcus faecalis</i>
325	gls24_glsB_1_1	<i>Enterococcus faecalis</i>
326	gph_1_1	<i>Enterococcus faecalis</i>
327	gyrAEf_1_1	<i>Enterococcus faecalis</i>
328	metEf_1_1	<i>Enterococcus faecalis</i>
329	mntHCb2_1_1	<i>Enterococcus faecalis</i>
330	mob2_1_1	<i>Enterococcus faecalis</i>
331	mvaD_1_1	<i>Enterococcus faecalis</i>
332	mvaE_1_1	<i>Enterococcus faecalis</i>
333	parC_1_1	<i>Enterococcus faecalis</i>
334	pcfG_1_1	<i>Enterococcus faecalis</i>
335	phoZ_1_1	<i>Enterococcus faecalis</i>
336	polC_1_1	<i>Enterococcus faecalis</i>
337	ptb_1_1	<i>Enterococcus faecalis</i>
338	recS1_1_1	<i>Enterococcus faecalis</i>
339	rpoN_1_1	<i>Enterococcus faecalis</i>
340	tms_1_1	<i>Enterococcus faecalis</i>
341	tyrDC_1_1	<i>Enterococcus faecalis</i>
342	tyrS_1_1	<i>Enterococcus faecalis</i>
343	asa1_1_1	<i>Enterococcus faecalis</i>
344	asp1_1_1	<i>Enterococcus faecalis</i>
345	cgh_1_1	<i>Enterococcus faecalis</i>
346	cylA_1_1	<i>Enterococcus faecalis</i>
347	cylB_1_1	<i>Enterococcus faecalis</i>
348	cylI_1_1	<i>Enterococcus faecalis</i>
349	cylL_cylS_1_1	<i>Enterococcus faecalis</i>
350	cylM_1_1	<i>Enterococcus faecalis</i>
351	ace_1_1	<i>Enterococcus faecalis</i>
352	ef00108_1_1	<i>Enterococcus faecalis</i>
353	ef00109_1_1	<i>Enterococcus faecalis</i>
354	ef0011_1_1	<i>Enterococcus faecalis</i>
355	ef00113_1_1	<i>Enterococcus faecalis</i>
356	ef0012_1_1	<i>Enterococcus faecalis</i>
357	ef0022_1_1	<i>Enterococcus faecalis</i>
358	ef0031_1_1	<i>Enterococcus faecalis</i>
359	ef0032_1_1	<i>Enterococcus faecalis</i>
360	ef0040_1_1	<i>Enterococcus faecalis</i>
361	ef0058_1_1	<i>Enterococcus faecalis</i>
362	enlA_1_1	<i>Enterococcus faecalis</i>
363	esa_1_1	<i>Enterococcus faecalis</i>
364	esp_1_1	<i>Enterococcus faecalis</i>
365	gelE_1_1	<i>Enterococcus faecalis</i>

SEQ ID NO	Probe name	Template source
366	groEL_1_1	<i>Enterococcus faecalis</i>
367	groES_1_1	<i>Enterococcus faecalis</i>
368	rt1_1_1	<i>Enterococcus faecalis</i>
369	sala_1_1	<i>Enterococcus faecalis</i>
370	salb_1_1	<i>Enterococcus faecalis</i>
371	sea1_1_1	<i>Enterococcus faecalis</i>
372	sep1_1_1	<i>Enterococcus faecalis</i>
373	vicK_1_1	<i>Enterococcus faecalis</i>
374	yycH_1_1	<i>Enterococcus faecalis</i>
375	yycI_1_1	<i>Enterococcus faecalis</i>
376	yycJ_1_1	<i>Enterococcus faecalis</i>
377	bglB_1_1	<i>Enterococcus faecium</i>
378	bglR_1_1	<i>Enterococcus faecium</i>
379	bglS_1_1	<i>Enterococcus faecium</i>
380	efmA_1_1	<i>Enterococcus faecium</i>
381	efmB_1_1	<i>Enterococcus faecium</i>
382	efmC_1_1	<i>Enterococcus faecium</i>
383	mreC_1_1	<i>Enterococcus faecium</i>
384	mreD_1_1	<i>Enterococcus faecium</i>
385	mvaDEfaecium_1_1	<i>Enterococcus faecium</i>
386	mvaEEfaecium_1_1	<i>Enterococcus faecium</i>
387	mvaK1Efaecium_1_1	<i>Enterococcus faecium</i>
388	mvaK2Efaecium_1_1	<i>Enterococcus faecium</i>
389	mvaSEfaecium_1_1	<i>Enterococcus faecium</i>
390	orf3_4Efaeciumb_1_1	<i>Enterococcus faecium</i>
391	orf6_7Efaecium_1_1	<i>Enterococcus faecium</i>
392	orf7_8Efaecium_1_1	<i>Enterococcus faecium</i>
393	orf9_10Efaecium_1_1	<i>Enterococcus faecium</i>
394	entA_entI_1_1	<i>Enterococcus faecium</i>
395	entD_1_1	<i>Enterococcus faecium</i>
396	entR_1_1	<i>Enterococcus faecium</i>
397	oep_1_1	<i>Enterococcus faecium</i>
398	sagA_1_2	<i>Enterococcus faecium</i>
399	atsA_1_1	<i>Klebsiella pneumoniae</i>
400	atsB_1_1	<i>Klebsiella pneumoniae</i>
401	budC_1_1	<i>Klebsiella pneumoniae</i>
402	citA_1_1	<i>Klebsiella pneumoniae</i>
403	citW_1_1	<i>Klebsiella pneumoniae</i>
404	citX_1_1	<i>Klebsiella pneumoniae</i>
405	dalD_1_1	<i>Klebsiella pneumoniae</i>
406	dalk_1_1	<i>Klebsiella pneumoniae</i>
407	dalT_1_1	<i>Klebsiella pneumoniae</i>
408	acoA_1_1	<i>Klebsiella pneumoniae</i>
409	acoB_1_1	<i>Klebsiella pneumoniae</i>
410	acoC_1_1	<i>Klebsiella pneumoniae</i>
411	ahkK_1_1	<i>Klebsiella pneumoniae</i>

SEQ ID NO	Probe name	Template source
412	fimK_1_1	<i>Klebsiella pneumoniae</i>
413	glfKPN2_1_1	<i>Klebsiella pneumoniae</i>
414	ltrA_1_1	<i>Klebsiella pneumoniae</i>
415	mdcC_1_1	<i>Klebsiella pneumoniae</i>
416	mdcF_1_1	<i>Klebsiella pneumoniae</i>
417	mdcH_1_1	<i>Klebsiella pneumoniae</i>
418	mrkA_1_1	<i>Klebsiella pneumoniae</i>
419	mtrK_1_1	<i>Klebsiella pneumoniae</i>
420	nifF_1_1	<i>Klebsiella pneumoniae</i>
421	nifK_1_1	<i>Klebsiella pneumoniae</i>
422	nifN_1_1	<i>Klebsiella pneumoniae</i>
423	tyrP_1_1	<i>Klebsiella pneumoniae</i>
424	ureA_1_1	<i>Klebsiella pneumoniae</i>
425	wbbO_1_1	<i>Klebsiella pneumoniae</i>
426	wza_1_1	<i>Klebsiella pneumoniae</i>
427	wzb_1_1	<i>Klebsiella pneumoniae</i>
428	wzmKPN2_1_1	<i>Klebsiella pneumoniae</i>
429	wztKPN2_1_1	<i>Klebsiella pneumoniae</i>
430	yojH_1_1	<i>Klebsiella pneumoniae</i>
431	liac_1_1	<i>Klebsiella pneumoniae</i>
432	cim_1_1	<i>Klebsiella pneumoniae</i>
433	aldA_1_1	<i>Klebsiella pneumoniae</i>
434	aldA_2_1	<i>Klebsiella pneumoniae</i>
435	hemly_1_1	<i>Klebsiella pneumoniae</i>
436	pSL017_1_1	<i>Klebsiella pneumoniae</i>
437	pSL020_1_1	<i>Klebsiella pneumoniae</i>
438	rcaA_1_1	<i>Klebsiella pneumoniae</i>
439	rmlC_1_1	<i>Klebsiella pneumoniae</i>
440	rmlD_1_1	<i>Klebsiella pneumoniae</i>
441	waaG_1_1	<i>Klebsiella pneumoniae</i>
442	wbbD_1_1	<i>Klebsiella pneumoniae</i>
443	wbbM_1_1	<i>Klebsiella pneumoniae</i>
444	wbbN_1_1	<i>Klebsiella pneumoniae</i>
445	wbdA_1_1	<i>Klebsiella pneumoniae</i>
446	wbdC_1_1	<i>Klebsiella pneumoniae</i>
447	wztKpn_1_1	<i>Klebsiella pneumoniae</i>
448	yibD_1_1	<i>Klebsiella pneumoniae</i>
449	cymA_1_1	<i>Klebsiella oxytoca</i>
450	cymD_1_1	<i>Klebsiella oxytoca</i>
451	cymE_1_1	<i>Klebsiella oxytoca</i>
452	cymH_1_1	<i>Klebsiella oxytoca</i>
453	cymI_1_1	<i>Klebsiella oxytoca</i>
454	cymJ_1_1	<i>Klebsiella oxytoca</i>
455	ddrA_1_1	<i>Klebsiella oxytoca</i>
456	fdt-1_1_1	<i>Klebsiella oxytoca</i>
457	fdt-2_1_1	<i>Klebsiella oxytoca</i>

SEQ ID NO	Probe name	Template source
458	fdt-3_1_1	<i>Klebsiella oxytoca</i>
459	gatY_1_1	<i>Klebsiella oxytoca</i>
460	hydH_1_1	<i>Klebsiella oxytoca</i>
461	masA_1_1	<i>Klebsiella oxytoca</i>
462	nasA_1_1	<i>Klebsiella oxytoca</i>
463	nasE_1_1	<i>Klebsiella oxytoca</i>
464	nasF_1_1	<i>Klebsiella oxytoca</i>
465	pehX_1_1	<i>Klebsiella oxytoca</i>
466	pelX_1_1	<i>Klebsiella oxytoca</i>
467	tagH_1_1	<i>Klebsiella oxytoca</i>
468	tagK_1_1	<i>Klebsiella oxytoca</i>
469	tagT_1_1	<i>Klebsiella oxytoca</i>
470	glpR_1_1	<i>Pseudomonas aeruginosa</i>
471	lasRb_1_1	<i>Pseudomonas aeruginosa</i>
472	OrfX_1_1	<i>Pseudomonas aeruginosa</i>
473	pa0260_1_1	<i>Pseudomonas aeruginosa</i>
474	pa0572_1_1	<i>Pseudomonas aeruginosa</i>
475	pa0625_1_1	<i>Pseudomonas aeruginosa</i>
476	pa0636_1_1	<i>Pseudomonas aeruginosa</i>
477	pa1046_1_1	<i>Pseudomonas aeruginosa</i>
478	pa1069_1_1	<i>Pseudomonas aeruginosa</i>
479	pa1846_1_1	<i>Pseudomonas aeruginosa</i>
480	pa3866_1_1	<i>Pseudomonas aeruginosa</i>
481	pa4082_1_1	<i>Pseudomonas aeruginosa</i>
482	pilAp_1_1	<i>Pseudomonas aeruginosa</i>
483	PilAp2_1_1	<i>Pseudomonas aeruginosa</i>
484	pilC_1_1	<i>Pseudomonas aeruginosa</i>
485	PstP_1_1	<i>Pseudomonas aeruginosa</i>
486	purK_1_1	<i>Pseudomonas aeruginosa</i>
487	uvrDII_1_1	<i>Pseudomonas aeruginosa</i>
488	vsmI_1_1	<i>Pseudomonas aeruginosa</i>
489	vsmR_1_2	<i>Pseudomonas aeruginosa</i>
490	xcpX_1_1	<i>Pseudomonas aeruginosa</i>
491	aprA_1_1	<i>Pseudomonas aeruginosa</i>
492	aprE_1_1	<i>Pseudomonas aeruginosa</i>
493	ctx_1_2	<i>Pseudomonas aeruginosa</i>
494	algB_1_1	<i>Pseudomonas aeruginosa</i>
495	algN_1_1	<i>Pseudomonas aeruginosa</i>
496	algR_1_1	<i>Pseudomonas aeruginosa</i>
497	ExoS_1_1	<i>Pseudomonas aeruginosa</i>
498	fpvA_1_1	<i>Pseudomonas aeruginosa</i>
499	lasRa_1_1	<i>Pseudomonas aeruginosa</i>
500	lipA_1_1	<i>Pseudomonas aeruginosa</i>
501	lipH_1_1	<i>Pseudomonas aeruginosa</i>
502	Orf159_1_2	<i>Pseudomonas aeruginosa</i>
503	Orf252_1_1	<i>Pseudomonas aeruginosa</i>

SEQ ID NO	Probe name	Template source
504	pchG_1_1	<i>Pseudomonas aeruginosa</i>
505	PhzA_1_1	<i>Pseudomonas aeruginosa</i>
506	PhzB_1_1	<i>Pseudomonas aeruginosa</i>
507	PLC_1_1	<i>Pseudomonas aeruginosa</i>
508	plcN_1_1	<i>Pseudomonas aeruginosa</i>
509	plcR_1_1	<i>Pseudomonas aeruginosa</i>
510	pvdD_1_1	<i>Pseudomonas aeruginosa</i>
511	pvdF_1_2	<i>Pseudomonas aeruginosa</i>
512	pyocinS1_1_1	<i>Pseudomonas aeruginosa</i>
513	pyocinS1im_1_1	<i>Pseudomonas aeruginosa</i>
514	pyocinS2_1_1	<i>Pseudomonas aeruginosa</i>
515	pys2_1_1	<i>Pseudomonas aeruginosa</i>
516	pys2_2_1	<i>Pseudomonas aeruginosa</i>
517	rbf303_1_1	<i>Pseudomonas aeruginosa</i>
518	rhIA_1_1	<i>Pseudomonas aeruginosa</i>
519	rhIB_1_1	<i>Pseudomonas aeruginosa</i>
520	rhIR_1_1	<i>Pseudomonas aeruginosa</i>
521	TnAP41_1_2	<i>Pseudomonas aeruginosa</i>
522	toxA_1_1	<i>Pseudomonas aeruginosa</i>
523	cap1EStrpneu_1_1	<i>Streptococcus pneumoniae</i>
524	cap1FStrpneu_1_1	<i>Streptococcus pneumoniae</i>
525	cap1GStrpneu_1_1	<i>Streptococcus pneumoniae</i>
526	cap3AStrpneu_1_1	<i>Streptococcus pneumoniae</i>
527	cap3BStrpneu_1_1	<i>Streptococcus pneumoniae</i>
528	celAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
529	celBStrpneu_1_1	<i>Streptococcus pneumoniae</i>
530	cglAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
531	cglBStrpneu_1_1	<i>Streptococcus pneumoniae</i>
532	cglCStrpneu_1_1	<i>Streptococcus pneumoniae</i>
533	cglDStrpneu_1_1	<i>Streptococcus pneumoniae</i>
534	cinA_1_1	<i>Streptococcus pneumoniae</i>
535	cps14EStrpneum_1_1	<i>Streptococcus pneumoniae</i>
536	cps14FStrpneum_1_1	<i>Streptococcus pneumoniae</i>
537	cps14GStrpneum_1_1	<i>Streptococcus pneumoniae</i>
538	cps14HStrpneum_1_1	<i>Streptococcus pneumoniae</i>
539	cps19aHStrpneum_1_1	<i>Streptococcus pneumoniae</i>
540	cps19aIStrpneum_1_1	<i>Streptococcus pneumoniae</i>
541	cps19aKStrpneum_1_1	<i>Streptococcus pneumoniae</i>
542	cps19fGStrpneum_1_1	<i>Streptococcus pneumoniae</i>
543	cps23fGStrpneum_1_1	<i>Streptococcus pneumoniae</i>
544	dexB_1_1	<i>Streptococcus pneumoniae</i>
545	dinF_1_1	<i>Streptococcus pneumoniae</i>
546	1760Strpneu_1_1	<i>Streptococcus pneumoniae</i>
547	acyPStrpneu_1_1	<i>Streptococcus pneumoniae</i>
548	endAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
549	exoAStrpneu_1_1	<i>Streptococcus pneumoniae</i>

SEQ ID NO	Probe name	Template source
550	exp72_1_1	<i>Streptococcus pneumoniae</i>
551	fnlAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
552	fnlBStrpneu_1_1	<i>Streptococcus pneumoniae</i>
553	fnlCStrpneu_1_1	<i>Streptococcus pneumoniae</i>
554	gct18Strpneum_1_1	<i>Streptococcus pneumoniae</i>
555	hexB1_1_1	<i>Streptococcus pneumoniae</i>
556	hftsHstrpneu_1_1	<i>Streptococcus pneumoniae</i>
557	immunofrag1Strpneu_1_1	<i>Streptococcus pneumoniae</i>
558	immunofrag2Strpneu_2_1	<i>Streptococcus pneumoniae</i>
559	immunofrag3Strpneu_2_1	<i>Streptococcus pneumoniae</i>
560	kdtBStrpneu_1_1	<i>Streptococcus pneumoniae</i>
561	lysAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
562	pcpBStrpneu_1_1	<i>Streptococcus pneumoniae</i>
563	pflCStrpneu_1_1	<i>Streptococcus pneumoniae</i>
564	plpA_1_1	<i>Streptococcus pneumoniae</i>
565	prtA1Strpneu_1_1	<i>Streptococcus pneumoniae</i>
566	pspC1Strpneu_1_1	<i>Streptococcus pneumoniae</i>
567	pspC2_1_1	<i>Streptococcus pneumoniae</i>
568	purRStrpneu_1_1	<i>Streptococcus pneumoniae</i>
569	pyrDAStrpneum_1_1	<i>Streptococcus pneumoniae</i>
570	SP0828Strpneu_1_1	<i>Streptococcus pneumoniae</i>
571	SP0830Strpneu_1_1	<i>Streptococcus pneumoniae</i>
572	SP0833Strpneu_1_1	<i>Streptococcus pneumoniae</i>
573	SP0837_38Strpneu_1_1	<i>Streptococcus pneumoniae</i>
574	SP0839Strpneu_1_1	<i>Streptococcus pneumoniae</i>
575	ugdStrpneu_1_1	<i>Streptococcus pneumoniae</i>
576	uncC_1_1	<i>Streptococcus pneumoniae</i>
577	vicXStrepneu_1_1	<i>Streptococcus pneumoniae</i>
578	wchA6bStrpneum_1_1	<i>Streptococcus pneumoniae</i>
579	wci4Strpneum_1_1	<i>Streptococcus pneumoniae</i>
580	wciK4Strpneum_1_1	<i>Streptococcus pneumoniae</i>
581	wciL4Strpneum_1_1	<i>Streptococcus pneumoniae</i>
582	wciN6bStrpneum_1_1	<i>Streptococcus pneumoniae</i>
583	wciO6bStrpneum_1_1	<i>Streptococcus pneumoniae</i>
584	wciP6bStrpneum_1_1	<i>Streptococcus pneumoniae</i>
585	wciY18Strpneum_1_1	<i>Streptococcus pneumoniae</i>
586	wzdbStrpneum_1_1	<i>Streptococcus pneumoniae</i>
587	wze6bStrpneum_1_1	<i>Streptococcus pneumoniae</i>
588	wzy18Strpneum_1_1	<i>Streptococcus pneumoniae</i>
589	wzy4Strpneum_1_1	<i>Streptococcus pneumoniae</i>
590	wzy6bStrpneum_1_1	<i>Streptococcus pneumoniae</i>
591	xpt_1_1	<i>Streptococcus pneumoniae</i>
592	igaStrpneu_1_1	<i>Streptococcus pneumoniae</i>
593	lytA_1_1	<i>Streptococcus pneumoniae</i>
594	nanA_1_1	<i>Streptococcus pneumoniae</i>
595	nanBStrpneu_1_1	<i>Streptococcus pneumoniae</i>

SEQ ID NO	Probe name	Template source
596	pcpCStrpneu_1_1	<i>Streptococcus pneumoniae</i>
597	ply_1_1	<i>Streptococcus pneumoniae</i>
598	prtAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
599	pspA_1_2	<i>Streptococcus pneumoniae</i>
600	SP0834Strpneu_1_1	<i>Streptococcus pneumoniae</i>
601	SP0834Strpneu_1_2	<i>Streptococcus pneumoniae</i>
602	sphtraStrpneu_1_1	<i>Streptococcus pneumoniae</i>
603	wciJStrpneu_1_1	<i>Streptococcus pneumoniae</i>
604	wziyStrpneu_1_1	<i>Streptococcus pneumoniae</i>
605	wzxStrpneu_1_1	<i>Streptococcus pneumoniae</i>
606	cpsA1Strgal_1_1	<i>Streptococcus agalactiae</i>
607	cpsB1Strgal_1_1	<i>Streptococcus agalactiae</i>
608	cpsC1Strgal_1_1	<i>Streptococcus agalactiae</i>
609	cpsD1Strgal_1_1	<i>Streptococcus agalactiae</i>
610	cpsE1Strgal_1_1	<i>Streptococcus agalactiae</i>
611	cpsG1Strgal_1_1	<i>Streptococcus agalactiae</i>
612	cpsIStrgal_1_1	<i>Streptococcus agalactiae</i>
613	cpsJStrgal_1_1	<i>Streptococcus agalactiae</i>
614	cpsKStrgal_1_1	<i>Streptococcus agalactiae</i>
615	cpsMStrgal_1_1	<i>Streptococcus agalactiae</i>
616	cpsYStrgal_1_1	<i>Streptococcus agalactiae</i>
617	cpsYStrgal_2_1	<i>Streptococcus agalactiae</i>
618	cylBStraga_1_1	<i>Streptococcus agalactiae</i>
619	cylEStraga_1_1	<i>Streptococcus agalactiae</i>
620	cylFStraga_1_1	<i>Streptococcus agalactiae</i>
621	cylHStraga_1_1	<i>Streptococcus agalactiae</i>
622	cylIStraga_1_1	<i>Streptococcus agalactiae</i>
623	cylJStraga_1_1	<i>Streptococcus agalactiae</i>
624	cylKStraga_1_1	<i>Streptococcus agalactiae</i>
625	0487Straga_1_1	<i>Streptococcus agalactiae</i>
626	0488Straga_1_1	<i>Streptococcus agalactiae</i>
627	0493Straga_1_1	<i>Streptococcus agalactiae</i>
628	0495Straga_1_1	<i>Streptococcus agalactiae</i>
629	0498Straga_1_1	<i>Streptococcus agalactiae</i>
630	0500Straga_1_1	<i>Streptococcus agalactiae</i>
631	0502Straga_1_1	<i>Streptococcus agalactiae</i>
632	0504Straga_1_1	<i>Streptococcus agalactiae</i>
633	foldStraga_1_1	<i>Streptococcus agalactiae</i>
634	neuA1Strgal_1_1	<i>Streptococcus agalactiae</i>
635	neuB1Strgal_1_1	<i>Streptococcus agalactiae</i>
636	neuC1Strgal_1_1	<i>Streptococcus agalactiae</i>
637	neuD1Strgal_1_1	<i>Streptococcus agalactiae</i>
638	recNStraga_1_1	<i>Streptococcus agalactiae</i>
639	ileSStraga_1_1	<i>Streptococcus agalactiae</i>
640	CAMPfactor_1_1	<i>Streptococcus agalactiae</i>
641	CAMPfactor_2_1	<i>Streptococcus agalactiae</i>

SEQ ID NO	Probe name	Template source
642	0499Straga_1_1	<i>Streptococcus agalactiae</i>
643	hylStragal_1_1	<i>Streptococcus agalactiae</i>
644	lipStragal_1_1	<i>Streptococcus agalactiae</i>
645	cyclStrpyog_1_1	<i>Streptococcus pyogenes</i>
646	fah_rph_hlo_Strpyog_1_1	<i>Streptococcus pyogenes</i>
647	int_1_1	<i>Streptococcus pyogenes</i>
648	int315.5_1_1	<i>Streptococcus pyogenes</i>
649	murEStrpyog_1_1	<i>Streptococcus pyogenes</i>
650	oppA_1_1	<i>Streptococcus pyogenes</i>
651	oppCStrpyog_1_1	<i>Streptococcus pyogenes</i>
652	oppD_1_1	<i>Streptococcus pyogenes</i>
653	SPy0382Strpyog_1_1	<i>Streptococcus pyogenes</i>
654	SPy0390Strpyog_1_1	<i>Streptococcus pyogenes</i>
655	Spym3_1351_1_1	<i>Streptococcus pyogenes</i>
656	vicXStrpyog_1_1	<i>Streptococcus pyogenes</i>
657	DNaseIStrpyog_1_1	<i>Streptococcus pyogenes</i>
658	fba2Strpyog_1_1	<i>Streptococcus pyogenes</i>
659	fhuAStrpyog_1_1	<i>Streptococcus pyogenes</i>
660	fhuB1Strpyog_1_1	<i>Streptococcus pyogenes</i>
661	fhuDStrpyog_1_1	<i>Streptococcus pyogenes</i>
662	fhuGStrpyog_1_1	<i>Streptococcus pyogenes</i>
663	hyla_1_1	<i>Streptococcus pyogenes</i>
664	hylP_1_1	<i>Streptococcus pyogenes</i>
665	hylp2_1_1	<i>Streptococcus pyogenes</i>
666	oppB_1_1	<i>Streptococcus pyogenes</i>
667	ropB_1_1	<i>Streptococcus pyogenes</i>
668	scpAStrpyog_1_1	<i>Streptococcus pyogenes</i>
669	sloStrpyog_1_1	<i>Streptococcus pyogenes</i>
670	smez-4Strpyog_1_1	<i>Streptococcus pyogenes</i>
671	sof_1_1	<i>Streptococcus pyogenes</i>
672	sof_2_1	<i>Streptococcus pyogenes</i>
673	speA_1_1	<i>Streptococcus pyogenes</i>
674	speB2Strpyog_1_1	<i>Streptococcus pyogenes</i>
675	speCStrpyog_1_1	<i>Streptococcus pyogenes</i>
676	speJStrpyog_1_1	<i>Streptococcus pyogenes</i>
677	srtBStrpyog_1_1	<i>Streptococcus pyogenes</i>
678	srtCStrpyog_1_1	<i>Streptococcus pyogenes</i>
679	srtEStrpyog_1_1	<i>Streptococcus pyogenes</i>
680	srtFStrpyog_1_1	<i>Streptococcus pyogenes</i>
681	srtGStrpyog_1_1	<i>Streptococcus pyogenes</i>
682	srtIStrpyog_1_1	<i>Streptococcus pyogenes</i>
683	srtKStrpyog_1_1	<i>Streptococcus pyogenes</i>
684	srtRStrpyog_1_1	<i>Streptococcus pyogenes</i>
685	srtTStrpyog_1_1	<i>Streptococcus pyogenes</i>
686	vickStrpyog_1_1	<i>Streptococcus pyogenes</i>
687	573Strpmut_1_1	<i>Streptococcus viridans</i>

SEQ ID NO	Probe name	Template source
688	580SStprmut_1_1	<i>Streptococcus viridans</i>
689	581_582SStprmut_1_1	<i>Streptococcus viridans</i>
690	584SStprmut_1_1	<i>Streptococcus viridans</i>
691	dltAStrmut_1_1	<i>Streptococcus viridans</i>
692	dltBStrmut_1_1	<i>Streptococcus viridans</i>
693	dltCpx1Strmut_1_1	<i>Streptococcus viridans</i>
694	dltDStrmut_1_1	<i>Streptococcus viridans</i>
695	lichStrbov_1_1	<i>Streptococcus viridans</i>
696	lytRStprmut_1_1	<i>Streptococcus viridans</i>
697	lytSStprmut_1_1	<i>Streptococcus viridans</i>
698	pepQStrmut_1_1	<i>Streptococcus viridans</i>
699	pflCStrmut_1_1	<i>Streptococcus viridans</i>
700	recNStprmut_1_1	<i>Streptococcus viridans</i>
701	ytqBStrmut_1_1	<i>Streptococcus viridans</i>
702	hlyXStrmut_1_1	<i>Streptococcus viridans</i>
703	igaStrmitis_1_1	<i>Streptococcus viridans</i>
704	igaStrsanguis_1_1	<i>Streptococcus viridans</i>
705	perMStrmut_1_1	<i>Streptococcus viridans</i>
706	atfA_1_1	<i>Proteus mirabilis</i>
707	atfB_1_1	<i>Proteus mirabilis</i>
708	atfC_1_1	<i>Proteus mirabilis</i>
709	ccmPrmi1_1_1	<i>Proteus mirabilis</i>
710	cyaPrmi_1_1	<i>Proteus mirabilis</i>
711	aad_1_1	<i>Proteus mirabilis</i>
712	flfB_1_1	<i>Proteus mirabilis</i>
713	flfD_1_1	<i>Proteus mirabilis</i>
714	flfN_1_1	<i>Proteus mirabilis</i>
715	flhD_1_1	<i>Proteus mirabilis</i>
716	floA_1_1	<i>Proteus mirabilis</i>
717	ftsK_1_1	<i>Proteus mirabilis</i>
718	gstB_1_1	<i>Proteus mirabilis</i>
719	hemCPrmi_1_1	<i>Proteus mirabilis</i>
720	hemDPrmi_1_1	<i>Proteus mirabilis</i>
721	hev_1_1	<i>Proteus mirabilis</i>
722	katA_1_1	<i>Proteus mirabilis</i>
723	lpp1_1_1	<i>Proteus mirabilis</i>
724	menE_1_1	<i>Proteus mirabilis</i>
725	mfd_1_1	<i>Proteus mirabilis</i>
726	nrpA_1_1	<i>Proteus mirabilis</i>
727	nrpB_1_1	<i>Proteus mirabilis</i>
728	nrpG_1_1	<i>Proteus mirabilis</i>
729	nrpS_1_1	<i>Proteus mirabilis</i>
730	nrpT_1_1	<i>Proteus mirabilis</i>
731	nrpU_1_1	<i>Proteus mirabilis</i>
732	pat_1_1	<i>Proteus mirabilis</i>
733	pmfA_1_1	<i>Proteus mirabilis</i>

SEQ ID NO	Probe name	Template source
734	pmfC_1_1	<i>Proteus mirabilis</i>
735	pmfE_1_1	<i>Proteus mirabilis</i>
736	ppaA_1_1	<i>Proteus mirabilis</i>
737	rsbA_1_1	<i>Proteus mirabilis</i>
738	rsbC_1_1	<i>Proteus mirabilis</i>
739	speB_1_1	<i>Proteus mirabilis</i>
740	stmA_1_1	<i>Proteus mirabilis</i>
741	stmB_1_1	<i>Proteus mirabilis</i>
742	terA_1_1	<i>Proteus mirabilis</i>
743	terD_1_1	<i>Proteus mirabilis</i>
744	umoA_1_1	<i>Proteus mirabilis</i>
745	umoB_1_1	<i>Proteus mirabilis</i>
746	umoC_1_1	<i>Proteus mirabilis</i>
747	ureR_1_1	<i>Proteus mirabilis</i>
748	xerC_1_1	<i>Proteus mirabilis</i>
749	ygbA_1_1	<i>Proteus mirabilis</i>
750	flaA_1_1	<i>Proteus mirabilis</i>
751	flaD_1_1	<i>Proteus mirabilis</i>
752	fliA_1_1	<i>Proteus mirabilis</i>
753	hpmA_1_1	<i>Proteus mirabilis</i>
754	hpmB_1_1	<i>Proteus mirabilis</i>
755	lpsPrmi_1_1	<i>Proteus mirabilis</i>
756	mrpA_1_1	<i>Proteus mirabilis</i>
757	mrpB_1_1	<i>Proteus mirabilis</i>
758	mrpC_1_1	<i>Proteus mirabilis</i>
759	mrpD_1_1	<i>Proteus mirabilis</i>
760	mrpE_1_1	<i>Proteus mirabilis</i>
761	mrpF_1_1	<i>Proteus mirabilis</i>
762	mrpG_1_1	<i>Proteus mirabilis</i>
763	mrpH_1_1	<i>Proteus mirabilis</i>
764	mrpI_1_1	<i>Proteus mirabilis</i>
765	mrpJ_1_1	<i>Proteus mirabilis</i>
766	patA_1_1	<i>Proteus mirabilis</i>
767	putA_1_1	<i>Proteus mirabilis</i>
768	uca_1_1	<i>Proteus mirabilis</i>
769	ureDPrmi_1_1	<i>Proteus mirabilis</i>
770	ureEPrmi_1_1	<i>Proteus mirabilis</i>
771	ureFPrmi_1_1	<i>Proteus mirabilis</i>
772	zapA_1_1	<i>Proteus mirabilis</i>
773	zapB_1_1	<i>Proteus mirabilis</i>
774	zapD_1_1	<i>Proteus mirabilis</i>
775	zapE_1_1	<i>Proteus mirabilis</i>
776	envZPrvu_1_1	<i>Proteus vulgaris</i>
777	frdC_1_1	<i>Proteus vulgaris</i>
778	frdD_1_1	<i>Proteus vulgaris</i>
779	infBPrvu_1_1	<i>Proteus vulgaris</i>

SEQ ID NO	Probe name	Template source
780	lad_1_1	<i>Proteus vulgaris</i>
781	tna2_1_1	<i>Proteus vulgaris</i>
782	end_1_1	<i>Proteus vulgaris</i>
783	pqrA_1_1	<i>Proteus vulgaris</i>
784	urg_1_1	<i>Proteus vulgaris</i>
785	blaIMP-7_1_1	<i>Pseudomonas aeruginosa</i>
786	mecISepid_1_1	<i>Staphylococcus epidermidis</i>
787	blaOXA-10_1_2	<i>Pseudomonas aeruginosa</i>
788	blaB_1_1	<i>Proteus vulgaris</i>
789	ampC_1_1	<i>Klebsiella oxytoca</i>
790	I-blaR_1_1	<i>Staphylococcus aureus</i>
791	blaOXA-32_1_1	<i>Pseudomonas aeruginosa</i>
792	bla-CTX-M-22_1_1	<i>Klebsiella pneumoniae</i>
793	pbp2aStrpneu_1_1	<i>Streptococcus pneumoniae</i>
794	blaSHV-1_1_1	<i>Klebsiella pneumoniae</i>
795	blaOXA-2_1_1	<i>Salmonella typhimurium</i>
796	blaRShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
797	blaIMP-7_1_2	<i>Pseudomonas aeruginosa</i>
798	I-mecR_1_1	<i>Staphylococcus aureus</i>
799	blaOXY_1_1	<i>Klebsiella oxytoca</i>
800	dacCStrpyog_1_1	<i>Streptococcus pyogenes</i>
801	femA_1_1	<i>Staphylococcus aureus</i>
802	mecA_1_1	<i>Staphylococcus aureus</i>
803	blaIShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
804	blavim_1_1	<i>Pseudomonas aeruginosa</i>
805	pbp2b_1_1	<i>Streptococcus pneumoniae</i>
806	pbp2primeSepid_1_1	<i>Staphylococcus epidermidis</i>
807	pbp2x_1_1	<i>Streptococcus pneumoniae</i>
808	pbp3Saureuc_1_1	<i>Staphylococcus aureus</i>
809	pbp4_1_1	<i>Enterococcus faecalis</i>
810	pbp5Efaecium_1_1	<i>Enterococcus faecium</i>
811	pbpC_1_1	<i>Enterococcus faecalis</i>
812	I-mecI_1_1	<i>Staphylococcus aureus</i>
813	pbp1a_1_1	<i>Streptococcus pneumoniae</i>
814	I-blaI_1_1	<i>Staphylococcus aureus</i>
815	blaTEM-106_1_1	<i>Escherichia coli</i>
816	blaOXY-KLOX_1_1	<i>Klebsiella oxytoca</i>
817	ftsWEF_1_1	<i>Enterococcus faecium</i>
818	fmhB_1_1	<i>Staphylococcus aureus</i>
819	cumA_1_1	<i>Proteus vulgaris</i>
820	femBShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
821	blaPER-1_1_1	<i>Pseudomonas aeruginosa</i>
822	bla_FOX-3_1_1	<i>Klebsiella oxytoca</i>
823	blaA_1_1	<i>Proteus vulgaris</i>
824	psrb_1_1	<i>Enterococcus faecium</i>
825	fmhA_1_1	<i>Staphylococcus aureus</i>

SEQ ID NO	Probe name	Template source
826	mecR1Sepid_1_1	<i>Staphylococcus epidermidis</i>
827	blaZ_1_1	<i>Staphylococcus aureus</i>
828	blaOXA-1_1_1	Plasmid RGN238
829	fox-6_1_1	<i>Klebsiella pneumoniae</i>
830	blaPrmi_1_1	<i>Proteus mirabilis</i>
831	aacA_aphDStwar_1_1	<i>Staphylococcus warneri</i>
832	aacC1_1_2	<i>Pseudomonas aeruginosa</i>
833	aacC2_1_1	<i>Escherichia coli</i>
834	strB_1_1	<i>Escherichia coli</i>
835	aadA_1_1	<i>Enterococcus faecalis</i>
836	aadB_1_2	<i>Escherichia coli</i>
837	aadD_1_1	<i>Staphylococcus aureus</i>
838	aacA4_1_2	<i>Pseudomonas aeruginosa</i>
839	strA_1_1	<i>Escherichia coli</i>
840	aph-A3_1_1	<i>Staphylococcus aureus</i>
841	aacC1_1_1	<i>Pseudomonas aeruginosa</i>
842	aacA4_1_1	<i>Pseudomonas aeruginosa</i>
843	aacA-aphD_1_1	<i>Staphylococcus aureus</i>
844	I-spc_1_1	<i>Staphylococcus aureus</i>
845	aphA3_1_1	synthetic construct
846	ermC_1_1	<i>Staphylococcus aureus</i>
847	linB_1_1	<i>Enterococcus faecium</i>
848	satSA_1_1	<i>Staphylococcus aureus</i>
849	mdrSA_1_1	<i>Staphylococcus aureus</i>
850	I-linA_1_1	<i>Staphylococcus aureus</i>
851	ermB_1_2	<i>Staphylococcus aureus</i>
852	ermA_1_1	<i>Staphylococcus aureus</i>
853	satA_1_1	<i>Enterococcus faecium</i>
854	msrA_1_1	<i>Staphylococcus aureus</i>
855	mphBM_1_1	<i>Staphylococcus aureus</i>
856	mefA_1_1	<i>Streptococcus pyogenes</i>
857	mrX_1_1	<i>Escherichia coli</i>
858	dfrStrpneu_1_1	<i>Streptococcus pneumoniae</i>
859	dfrA_1_1	<i>Staphylococcus aureus</i>
860	cmlA5_1_1	<i>Escherichia coli</i>
861	catEfaecium_1_1	<i>Enterococcus faecium</i>
862	cat_1_1	<i>Staphylococcus aureus</i>
863	tetAJ_1_1	<i>Proteus mirabilis</i>
864	tetL_1_1	<i>Enterococcus faecalis</i>
865	tetM_1_1	<i>Enterococcus faecalis</i>
866	vanH(tn)_1_1	<i>Enterococcus faecium</i>
867	vanA_1_1	<i>Enterococcus faecium</i>
868	vanHB2_1_1	<i>Enterococcus faecium</i>
869	vanR_1_1	<i>Enterococcus faecium</i>
870	vanRB2_1_1	<i>Enterococcus faecium</i>
871	vanS(tn)_1_1	<i>Enterococcus faecium</i>

SEQ ID NO	Probe name	Template source
872	vanSB2_1_1	<i>Enterococcus faecium</i>
873	vanWB2_1_1	<i>Enterococcus faecium</i>
874	ddl_1_1	<i>Enterococcus faecalis</i>
875	ble_1_1	<i>Staphylococcus aureus</i>
876	vanXB2_1_1	<i>Enterococcus faecium</i>
877	vanY(tn)_1_1	<i>Enterococcus faecium</i>
878	vanYB2_1_1	<i>Enterococcus faecium</i>
879	vanB_1_1	<i>Enterococcus faecalis</i>
880	vanZ(tn)_1_1	<i>Enterococcus faecium</i>
881	vanC-2_1_1	<i>Enterococcus flavescens</i>
882	vanX(tn)_1_1	<i>Enterococcus faecium</i>
883	acrB_1_1	<i>Proteus mirabilis</i>
884	mexB_1_2	<i>Pseudomonas aeruginosa</i>
885	I-qacA_1_1	<i>Staphylococcus aureus</i>
886	sulI_1_1	<i>Escherichia coli</i>
887	sul_1_1	<i>Escherichia coli</i>
888	cadBStalugd_1_1	<i>Staphylococcus lugdunensis</i>
889	mexA_1_1	<i>Pseudomonas aeruginosa</i>
890	acrR_1_1	<i>Proteus mirabilis</i>
891	emeA_1_1	<i>Enterococcus faecalis</i>
892	acrA_1_1	<i>Proteus mirabilis</i>
893	rtn_1_1	<i>Proteus vulgaris</i>
894	abcXStrpmut_1_1	<i>Streptococcus mutans</i>
895	qacEdelta1_1_1	<i>Escherichia coli</i>
896	elkT-abcA_1_1	<i>Staphylococcus aureus</i>
897	I-cadA_1_1	<i>Staphylococcus aureus</i>
898	albA_1_1	<i>Klebsiella oxytoca</i>
899	wzm_1_1	<i>Klebsiella pneumoniae</i>
900	msrCb_1_1	<i>Enterococcus faecium</i>
901	nov_1_1	<i>Escherichia coli</i>
902	wzt_1_1	<i>Klebsiella pneumoniae</i>
903	wbbl_1_1	<i>Klebsiella pneumoniae</i>
904	norA23_1_1	<i>Staphylococcus aureus</i>
905	mexR_1_1	<i>Pseudomonas aeruginosa</i>
906	arr2_1_1	<i>Escherichia coli</i>
907	mreA_1_1	<i>Staphylococcus aureus</i>
908	I-cadC_1_1	<i>Staphylococcus aureus</i>
909	uvrA_1_1	<i>Enterococcus faecalis</i>
910	CRD2_1_1	<i>Candida albicans</i>
911	CDR1_1_1	<i>Candida albicans</i>
912	CDR1_2_1	<i>Candida albicans</i>
913	MET3_1_1	<i>Candida albicans</i>
914	FET3_1_1	<i>Candida albicans</i>
915	FTR2_1_1	<i>Candida albicans</i>
916	MDR1-7_1_1	<i>Candida albicans</i>
917	ERG11_1_1	<i>Candida albicans</i>

SEQ ID NO	Probe name	Template source
918	SEC20_1_1	<i>Candida albicans</i>
919	rbcL_1_1	<i>Glycine max</i>
920	LDHA(hu)_1_1	<i>Homo sapiens</i>
921	GAPD(hu)_1_1	<i>Homo sapiens</i>
922	b-Act(hu)_1_1	<i>Homo sapiens</i>
923	ARHGDIA(hu)_1_1	<i>Homo sapiens</i>
924	PGK1(hu)_1_1	<i>Homo sapiens</i>
925	rbcL_1_2	<i>Glycine max</i>
926	16SPa_1_1	<i>Pseudomonas aeruginosa</i>
927	23SEfaecium_2_1	<i>Enterococcus faecium</i>
928	16SStrepyog_1_1	<i>Streptococcus pyogenes</i>
929	16SStrepneu_1_1	<i>Streptococcus pneumoniae</i>
930	16SStrepagalactiae_1_1	<i>Streptococcus agalactiae</i>
931	16SEfaecium_1_1	<i>Enterococcus faecium</i>
932	16SEfaecium_2_1	<i>Enterococcus faecium</i>
933	16SRNAEf_2_1	<i>Enterococcus faecalis</i>
934	16SKpn_1_1	<i>Klebsiella pneumoniae</i>
935	16SSa_3_1	<i>Staphylococcus aureus</i>
936	16SRNAEf_1_1	<i>Enterococcus faecalis</i>
937	16SShominis_1_1	<i>Staphylococcus hominis</i>
938	16SShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
939	23SEfaecium_1_1	<i>Enterococcus faecium</i>
940	16SrRNAPrmi_1_1	<i>Proteus mirabilis</i>
941	16SrRNAPrvu1_1_1	<i>Proteus vulgaris</i>
942	16SSa_1_1	<i>Staphylococcus aureus</i>
943	16SKlox_1_1	<i>Klebsiella oxytoca</i>
944	p53_1_1	<i>Mus musculus</i>
945	0135mihck_1_1	<i>Dictyostelium discoideum</i>
946	FAN_1_1	<i>Mus musculus</i>
947	0270cap_1_1	<i>Dictyostelium discoideum</i>
2842	16SStrepdysgal_1_1	<i>Streptococcus dysgalactiae</i>
2843	carO_1_1	<i>Acinetobacter baumannii</i>
2844	gacS_1_1	<i>Acinetobacter baumannii</i>
2845	dhbA_1_1	<i>Acinetobacter baumannii</i>
2846	dhbB_1_1	<i>Acinetobacter baumannii</i>
2847	sid_1_1	<i>Acinetobacter baumannii</i>
2848	csuD_1_1	<i>Acinetobacter baumannii</i>
2849	csuC_1_1	<i>Acinetobacter baumannii</i>
2850	tnp-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2851	waaA-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2852	csuB_1_1	<i>Acinetobacter baumannii</i>
2853	csuA_B_1_1	<i>Acinetobacter baumannii</i>
2854	csuA_1_1	<i>Acinetobacter baumannii</i>
2855	put1_1_1	<i>Acinetobacter baumannii</i>
2856	por_1_1	<i>Acinetobacter baumannii</i>
2857	abc_1_1	<i>Acinetobacter baumannii</i>

SEQ ID NO	Probe name	Template source
2858	furACIBA_1_1	<i>Acinetobacter baumannii</i>
2859	dec_1_1	<i>Acinetobacter baumannii</i>
2860	cysI_1_1	<i>Acinetobacter baumannii</i>
2861	trpE_1_1	<i>Acinetobacter baumannii</i>
2862	put3_1_1	<i>Acinetobacter baumannii</i>
2863	ompA-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2864	aacA4ENCL_1_1	<i>Enterobacter cloacae</i>
2865	AdeR-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2866	adeA-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2867	aac(6p)-lb7_1_1	<i>Enterobacter cloacae</i>
2868	adeB-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2869	adeC-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2870	AdeS-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2871	blaL2_1_1	<i>Stenotrophomonas maltophilia</i>
2872	blaMIR-3_1_1	<i>Enterobacter cloacae</i>
2873	ampR_1_1	<i>Enterobacter cloacae</i>
2874	ampC-ENCL_1_1	<i>Enterobacter cloacae</i>
2875	blaL1_1_1	<i>Stenotrophomonas maltophilia</i>
2876	asr_1_1	<i>Enterobacter cloacae</i>
2877	lacZ_1_1	<i>Enterobacter cloacae</i>
2878	ehuS_1_1	<i>Enterobacter cloacae</i>
2879	ehuV_1_1	<i>Enterobacter cloacae</i>
2880	slyA_1_1	<i>Enterobacter cloacae</i>
2881	ORF165_1_1	<i>Enterobacter cloacae</i>
2882	ehuU_1_1	<i>Enterobacter cloacae</i>
2883	ehuT_1_1	<i>Enterobacter cloacae</i>
2884	ORF295_1_1	<i>Enterobacter cloacae</i>
2885	ehuA_1_1	<i>Enterobacter cloacae</i>
2886	ORF400_1_1	<i>Enterobacter cloacae</i>
2887	H+ATPase_1_1	<i>Enterococcus faecium</i>
2888	sulII_1_1	<i>Acinetobacter baumannii</i>
2889	smeE_1_1	<i>Stenotrophomonas maltophilia</i>
2890	eE_1_1	<i>Stenotrophomonas maltophilia</i>
2891	StmPr1_1_1	<i>Stenotrophomonas maltophilia</i>
2892	eD_2_1	<i>Stenotrophomonas maltophilia</i>
2893	ppi_1_1	<i>Stenotrophomonas maltophilia</i>
2894	pmp-STEMA_1_1	<i>Stenotrophomonas maltophilia</i>
2895	pam_1_1	<i>Stenotrophomonas maltophilia</i>
2896	ORF4-STEMA_1_1	<i>Stenotrophomonas maltophilia</i>
2897	ORF2-STEMA_1_1	<i>Stenotrophomonas maltophilia</i>
2898	et_1_1	<i>Stenotrophomonas maltophilia</i>
2899	eF_1_1	<i>Stenotrophomonas maltophilia</i>
2900	StmPr2_1_1	<i>Stenotrophomonas maltophilia</i>
2901	smeF4494_1_1	<i>Stenotrophomonas maltophilia</i>
2902	coa_3_1	<i>Staphylococcus aureus</i>
2903	coa_2_2	<i>Staphylococcus aureus</i>

SEQ ID NO	Probe name	Template source
2904	fasCAXStrdysg_1_1	<i>Streptococcus dysgalactiae</i>
2905	sloStrep_1_1	<i>Streptococcus dysgalactiae</i>
2906	ydhK_1_1	<i>Staphylococcus hominis</i>
2907	tetA-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2908	tetR-ACIBA_1_1	<i>Acinetobacter baumannii</i>

b) primer sequences

SEQ ID NO	Probe name	Direction
948	cataSaur_1_1	F(orward)
949	cataSaur_1_1	R(everse)
950	cataSaur_1_2	F
951	cataSaur_1_2	R
952	clfA_1_1	F
953	clfA_1_1	R
954	clfB_1_1	F
955	clfB_1_1	R
956	coa_1_1	F
957	coa_1_1	R
958	coa_1_2	F
959	coa_1_2	R
960	I-clpC_1_1	F
961	I-clpC_1_1	R
962	I-clpP_1_1	F
963	I-clpP_1_1	R
964	I-ctaA_1_1	F
965	I-ctaA_1_1	R
966	I-ctsR_1_1	F
967	I-ctsR_1_1	R
968	I-dltA_1_1	F
969	I-dltA_1_1	R
970	I-dltB_1_1	F
971	I-dltB_1_1	R
972	I-dltC_1_1	F
973	I-dltC_1_1	R
974	I-dnaK_1_1	F
975	I-dnaK_1_1	R
976	I-elkT_1_1	F
977	I-elkT_1_1	R
978	I-femD_1_1	F
979	I-femD_1_1	R
980	I-glnA_1_1	F
981	I-glnA_1_1	R
982	I-glnR_1_1	F

SEQ ID NO	Probe name	Direction
983	I-glnR_1_1	R
984	I-grlA_1_1	F
985	I-grlA_1_1	R
986	I-grlB_1_1	F
987	I-grlB_1_1	R
988	I-groEL_1_1	F
989	I-groEL_1_1	R
990	I-groES_1_1	F
991	I-groES_1_1	R
992	I-hemA_1_1	F
993	I-hemA_1_1	R
994	I-hemE_1_1	F
995	I-hemE_1_1	R
996	I-hemH_1_1	F
997	I-hemH_1_1	R
998	I-hemL_1_1	F
999	I-hemL_1_1	R
1000	I-hemY_1_1	F
1001	I-hemY_1_1	R
1002	I-lepA_1_1	F
1003	I-lepA_1_1	R
1004	I-lrgA_1_1	F
1005	I-lrgA_1_1	R
1006	I-lrgB_1_1	F
1007	I-lrgB_1_1	R
1008	I-lytM_1_1	F
1009	I-lytM_1_1	R
1010	I-menB_1_1	F
1011	I-menB_1_1	R
1012	I-menD_1_1	F
1013	I-menD_1_1	R
1014	I-menE_1_1	F
1015	I-menE_1_1	R
1016	I-menF_1_1	F
1017	I-menF_1_1	R
1018	I-mreB_1_1	F
1019	I-mreB_1_1	R
1020	I-mreR_1_1	F
1021	I-mreR_1_1	R
1022	I-mutL_1_1	F
1023	I-mutL_1_1	R
1024	I-mutS_1_1	F
1025	I-mutS_1_1	R
1026	I-NAG_1_1	F

SEQ ID NO	Probe name	Direction
1027	I-NAG_1_1	R
1028	I-pbg_1_1	F
1029	I-pbg_1_1	R
1030	I-pbpF_1_1	F
1031	I-pbpF_1_1	R
1032	I-pdhB_1_1	F
1033	I-pdhB_1_1	R
1034	I-pdhC_1_1	F
1035	I-pdhC_1_1	R
1036	I-rsbU_1_1	F
1037	I-rsbU_1_1	R
1038	I-rsbV_1_1	F
1039	I-rsbV_1_1	R
1040	I-rsbW_1_1	F
1041	I-rsbW_1_1	R
1042	I-sgp_1_1	F
1043	I-sgp_1_1	R
1044	I-sirR_1_1	F
1045	I-sirR_1_1	R
1046	I-sodA_1_1	F
1047	I-sodA_1_1	R
1048	I-sodB_1_1	F
1049	I-sodB_1_1	R
1050	I-sstA_1_1	F
1051	I-sstA_1_1	R
1052	I-sstB_1_1	F
1053	I-sstB_1_1	R
1054	I-sstC_1_1	F
1055	I-sstC_1_1	R
1056	I-sstD_1_1	F
1057	I-sstD_1_1	R
1058	I-trx_1_1	F
1059	I-trx_1_1	R
1060	I-yhiN_1_1	F
1061	I-yhiN_1_1	R
1062	epiP-bsaP_1_1	F
1063	epiP-bsaP_1_1	R
1064	geh_1_1	F
1065	geh_1_1	R
1066	gyrA_1_1	F
1067	gyrA_1_1	R
1068	gyrB_1_1	F
1069	gyrB_1_1	R
1070	hemB_1_1	F

SEQ ID NO	Probe name	Direction
1071	hemB_1_1	R
1072	hemC_1_1	F
1073	hemC_1_1	R
1074	hemD_1_1	F
1075	hemD_1_1	R
1076	hemN_1_1	F
1077	hemN_1_1	R
1078	hsdS_1_1	F
1079	hsdS_1_1	R
1080	hsdS_2_1	F
1081	hsdS_2_1	R
1082	lip_1_1	F
1083	lip_1_1	R
1084	menC_1_1	F
1085	menC_1_1	R
1086	murC_1_1	F
1087	murC_1_1	R
1088	nuc_1_1	F
1089	nuc_1_1	R
1090	pdhD_1_1	F
1091	pdhD_1_1	R
1092	rpoB_1_1	F
1093	rpoB_1_1	R
1094	SAV0431_1_1	F
1095	SAV0431_1_1	R
1096	SAV0439_1_1	F
1097	SAV0439_1_1	R
1098	SAV0440_1_1	F
1099	SAV0440_1_1	R
1100	SAV0441_1_1	F
1101	SAV0441_1_1	R
1102	sigB_1_1	F
1103	sigB_1_1	R
1104	spa_1_2	F
1105	spa_1_2	R
1106	sstC_1_1	F
1107	sstC_1_1	R
1108	tag_1_1	F
1109	tag_1_1	R
1110	tyrA_1_1	F
1111	tyrA_1_1	R
1112	I-aroC_1_1	F
1113	I-aroC_1_1	R
1114	I-aroA_1_1	F

SEQ ID NO	Probe name	Direction
1115	I-aroA_1_1	R
1116	I-cna_1_1	F
1117	I-cna_1_1	R
1118	I-ebpS_1_1	F
1119	I-ebpS_1_1	R
1120	I-eno_1_1	F
1121	I-eno_1_1	R
1122	I-fbpA_1_1	F
1123	I-fbpA_1_1	R
1124	I-fib_1_1	F
1125	I-fib_1_1	R
1126	I-fnbB_1_1	F
1127	I-fnbB_1_1	R
1128	I-srtA_1_1	F
1129	I-srtA_1_1	R
1130	I-stpC_1_1	F
1131	I-stpC_1_1	R
1132	I-fnbA_1_1	F
1133	I-fnbA_1_1	R
1134	I-spa_1_1	F
1135	I-spa_1_1	R
1136	I-aroE_1_1	F
1137	I-aroE_1_1	R
1138	I-aroF_1_1	F
1139	I-aroF_1_1	R
1140	I-aroG_1_1	F
1141	I-aroG_1_1	R
1142	I-asp23_1_1	F
1143	I-asp23_1_1	R
1144	I-atl_1_1	F
1145	I-atl_1_1	R
1146	bsaE_1_1	F
1147	bsaE_1_1	R
1148	bsaG_1_1	F
1149	bsaG_1_1	R
1150	cap5h_1_1	F
1151	cap5h_1_1	R
1152	cap5i_1_1	F
1153	cap5i_1_1	R
1154	cap5j_1_1	F
1155	cap5j_1_1	R
1156	cap5k_1_1	F
1157	cap5k_1_1	R
1158	cap8H_1_1	F

SEQ ID NO	Probe name	Direction
1159	cap8H_1_1	R
1160	cap8I_1_1	F
1161	cap8I_1_1	R
1162	cap8J_1_1	F
1163	cap8J_1_1	R
1164	cap8K_1_1	F
1165	cap8K_1_1	R
1166	I-hld_1_1	F
1167	I-hld_1_1	R
1168	I-hysA_1_1	F
1169	I-hysA_1_1	R
1170	I-IgGbg_1_1	F
1171	I-IgGbg_1_1	R
1172	EDIN_1_1	F
1173	EDIN_1_1	R
1174	eta_1_1	F
1175	eta_1_1	R
1176	etb_1_1	F
1177	etb_1_1	R
1178	hglA_1_1	F
1179	hglA_1_1	R
1180	hglA_2_1	F
1181	hglA_2_1	R
1182	hglB_1_1	F
1183	hglB_1_1	R
1184	hglC_2_1	F
1185	hglC_2_1	R
1186	hla_1_1	F
1187	hla_1_1	R
1188	hlb_1_2	F
1189	hlb_1_2	R
1190	lukF_1_1	F
1191	lukF_1_1	R
1192	lukS_1_1	F
1193	lukS_1_1	R
1194	lukS_2_1	F
1195	lukS_2_1	R
1196	NAG_1_1	F
1197	NAG_1_1	R
1198	sak_1_1	F
1199	sak_1_1	R
1200	sea_1_1	F
1201	sea_1_1	R
1202	seb_1_1	F

SEQ ID NO	Probe name	Direction
1203	seb_1_1	R
1204	sec1_1_1	F
1205	sec1_1_1	R
1206	seg_1_1	F
1207	seg_1_1	R
1208	seh_1_1	F
1209	seh_1_1	R
1210	sel_1_1	F
1211	sel_1_1	R
1212	set15_1_1	F
1213	set15_1_1	R
1214	set6_1_1	F
1215	set6_1_1	R
1216	set7_1_1	F
1217	set7_1_1	R
1218	set8_1_1	F
1219	set8_1_1	R
1220	sprV8_1_1	F
1221	sprV8_1_1	R
1222	tst_1_1	F
1223	tst_1_1	R
1224	I-sdrC_1_1	F
1225	I-sdrC_1_1	R
1226	I-sdrD_1_1	F
1227	I-sdrD_1_1	R
1228	I-sdrE_1_1	F
1229	I-sdrE_1_1	R
1230	b1169_1_1	F
1231	b1169_1_1	R
1232	envZ_1_1	F
1233	envZ_1_1	R
1234	fliCb_1_1	F
1235	fliCb_1_1	R
1236	nfrB_1_1	F
1237	nfrB_1_1	R
1238	nlpA_1_1	F
1239	nlpA_1_1	R
1240	pilAe_1_1	F
1241	pilAe_1_1	R
1242	yacH_1_1	F
1243	yacH_1_1	R
1244	yagX_1_1	F
1245	yagX_1_1	R
1246	ycdS_1_1	F

SEQ ID NO	Probe name	Direction
1247	ycdS_1_1	R
1248	yciQ_1_1	F
1249	yciQ_1_1	R
1250	ymcA_1_1	F
1251	ymcA_1_1	R
1252	b1202_1_1	F
1253	b1202_1_1	R
1254	eae_1_1	F
1255	eae_1_1	R
1256	eltB_1_1	F
1257	eltB_1_1	R
1258	escR_1_1	F
1259	escR_1_1	R
1260	escT_1_1	F
1261	escT_1_1	R
1262	escU_1_1	F
1263	escU_1_1	R
1264	espB_1_1	F
1265	espB_1_1	R
1266	fes_1_1	F
1267	fes_1_1	R
1268	fes_2_1	F
1269	fes_2_1	R
1270	fteA_1_1	F
1271	fteA_1_1	R
1272	hlyA_1_1	F
1273	hlyA_1_1	R
1274	hlyB_1_1	F
1275	hlyB_1_1	R
1276	iucA_1_1	F
1277	iucA_1_1	R
1278	iucB_1_1	F
1279	iucB_1_1	R
1280	iucC_1_1	F
1281	iucC_1_1	R
1282	papG_1_1	F
1283	papG_1_1	R
1284	rfbE_1_1	F
1285	rfbE_1_1	R
1286	shuA_1_1	F
1287	shuA_1_1	R
1288	SLTII_1_1	F
1289	SLTII_1_1	R
1290	toxA-LTPA_1_1	F

SEQ ID NO	Probe name	Direction
1291	toxA-LTPA_1_1	R
1292	VT2vaB_1_1	F
1293	VT2vaB_1_1	R
1294	ardeSE0106_1_1	F
1295	ardeSE0106_1_1	R
1296	ardeSE0107_1_1	F
1297	ardeSE0107_1_1	R
1298	aroiSE0105_1_1	F
1299	aroiSE0105_1_1	R
1300	atIE_1_1	F
1301	atIE_1_1	R
1302	agrB_1_1	F
1303	agrB_1_1	R
1304	agrC_1_1	F
1305	agrC_1_1	R
1306	alphSE1368_1_1	F
1307	alphSE1368_1_1	R
1308	gad_1_1	F
1309	gad_1_1	R
1310	glucSE1191_1_1	F
1311	glucSE1191_1_1	R
1312	hsp10_1_1	F
1313	hsp10_1_1	R
1314	icaA_1_1	F
1315	icaA_1_1	R
1316	icaB_1_1	F
1317	icaB_1_1	R
1318	mvaSSepid_1_1	F
1319	mvaSSepid_1_1	R
1320	nitreSE1972_1_1	F
1321	nitreSE1972_1_1	R
1322	nitreSE1974_1_1	F
1323	nitreSE1974_1_1	R
1324	nitreSE1975_1_1	F
1325	nitreSE1975_1_1	R
1326	oiamtSE1209_1_1	F
1327	oiamtSE1209_1_1	R
1328	ORF1Sepid_1_1	F
1329	ORF1Sepid_1_1	R
1330	ORF3bSepid_1_1	F
1331	ORF3bSepid_1_1	R
1332	qacR_1_1	F
1333	qacR_1_1	R
1334	sin_1_1	F

SEQ ID NO	Probe name	Direction
1335	sin_1_1	R
1336	ureSE1861_1_1	F
1337	ureSE1861_1_1	R
1338	ureSE1863_1_1	F
1339	ureSE1863_1_1	R
1340	ureSE1864_1_1	F
1341	ureSE1864_1_1	R
1342	ureSE1865_1_1	F
1343	ureSE1865_1_1	R
1344	ureSE1867_1_1	F
1345	ureSE1867_1_1	R
1346	gcaD_1_1	F
1347	gcaD_1_1	R
1348	hld_orf5_1_1	F
1349	hld_orf5_1_1	R
1350	icaC_1_1	F
1351	icaC_1_1	R
1352	icaD_1_1	F
1353	icaD_1_1	R
1354	icaR_1_1	F
1355	icaR_1_1	R
1356	psm_beta1and2_1_1	F
1357	psm_beta1and2_1_1	R
1358	purR_1_1	F
1359	purR_1_1	R
1360	spoVG_1_1	F
1361	spoVG_1_1	R
1362	yabJ_1_1	F
1363	yabJ_1_1	R
1364	folQShaemolyt_1_1	F
1365	folQShaemolyt_1_1	R
1366	mvaCShaemolyticus_1_1	F
1367	mvaCShaemolyticus_1_1	R
1368	mvaDShaemolyt_1_1	F
1369	mvaDShaemolyt_1_1	R
1370	mvaK1Shaemolyticus_1_1	F
1371	mvaK1Shaemolyticus_1_1	R
1372	mvaSShaemolyticus_1_1	F
1373	mvaSShaemolyticus_1_1	R
1374	RNApolsigm_1_1	F
1375	RNApolsigm_1_1	R
1376	lipShaemolyt_1_1	F
1377	lipShaemolyt_1_1	R
1378	agrB2Stalugd_1_1	F

SEQ ID NO	Probe name	Direction
1379	agrB2Stalugd_1_1	R
1380	agrC2Stalugd_1_1	F
1381	agrC2Stalugd_1_1	R
1382	agrCStalugd_1_1	F
1383	agrCStalugd_1_1	R
1384	slamStalugd_1_1	F
1385	slamStalugd_1_1	R
1386	fblStalugd_1_1	F
1387	fblStalugd_1_1	R
1388	slushABCStalugd_1_1	F
1389	slushABCStalugd_1_1	R
1390	RNApolsigmSsapro_1_1	F
1391	RNApolsigmSsapro_1_1	R
1392	RNApolsigmSsapro_1_2	F
1393	RNApolsigmSsapro_1_2	R
1394	msrw1Stwar_1_1	F
1395	msrw1Stwar_1_1	R
1396	nukMStwar_1_1	F
1397	nukMStwar_1_1	R
1398	proDStwar_1_1	F
1399	proDStwar_1_1	R
1400	proMStwar_1_1	F
1401	proMStwar_1_1	R
1402	sigrpoStwar_1_1	F
1403	sigrpoStwar_1_1	R
1404	tnpStwar_1_1	F
1405	tnpStwar_1_1	R
1406	gehAStwar_1_1	F
1407	gehAStwar_1_1	R
1408	ARG56_1_1	F
1409	ARG56_1_1	R
1410	ASL43f_1_1	F
1411	ASL43f_1_1	R
1412	BGL2_1_1	F
1413	BGL2_1_1	R
1414	CACHS3_1_1	F
1415	CACHS3_1_1	R
1416	CCT8_1_1	F
1417	CCT8_1_1	R
1418	CDC37_1_1	F
1419	CDC37_1_1	R
1420	CEF3_1_1	F
1421	CEF3_1_1	R
1422	CHS1_1_1	F

SEQ ID NO	Probe name	Direction
1423	CHS1_1_1	R
1424	CHS2_1_1	F
1425	CHS2_1_1	R
1426	CHS4_1_1	F
1427	CHS4_1_1	R
1428	CHS5_1_1	F
1429	CHS5_1_1	R
1430	CHT1_1_1	F
1431	CHT1_1_1	R
1432	CHT2_1_1	F
1433	CHT2_1_1	R
1434	CHT4_1_1	F
1435	CHT4_1_1	R
1436	CSA1_1_1	F
1437	CSA1_1_1	R
1438	5triphosphatase_1_1	F
1439	5triphosphatase_1_1	R
1440	AAF1_1_1	F
1441	AAF1_1_1	R
1442	ADH1_1_1	F
1443	ADH1_1_1	R
1444	ALS1_1_1	F
1445	ALS1_1_1	R
1446	ALS7_1_1	F
1447	ALS7_1_1	R
1448	EDT1_1_1	F
1449	EDT1_1_1	R
1450	ELF_1_1	F
1451	ELF_1_1	R
1452	ESS1_1_1	F
1453	ESS1_1_1	R
1454	FAL1_1_1	F
1455	FAL1_1_1	R
1456	GAP1_1_1	F
1457	GAP1_1_1	R
1458	GNA1_1_1	F
1459	GNA1_1_1	R
1460	GSC1_1_1	F
1461	GSC1_1_1	R
1462	GSL1_1_1	F
1463	GSL1_1_1	R
1464	HIS1_1_1	F
1465	HIS1_1_1	R
1466	HTS1_1_1	F

SEQ ID NO	Probe name	Direction
1467	HTS1_1_1	R
1468	HWP1_2_1	F
1469	HWP1_2_1	R
1470	HYR1_1_1	F
1471	HYR1_1_1	R
1472	INT1a_1_1	F
1473	INT1a_1_1	R
1474	KRE15f_1_1	F
1475	KRE15f_1_1	R
1476	KRE6_1_1	F
1477	KRE6_1_1	R
1478	KRE9_1_1	F
1479	KRE9_1_1	R
1480	MIG1_1_1	F
1481	MIG1_1_1	R
1482	MLS1_1_1	F
1483	MLS1_1_1	R
1484	MP65_1_1	F
1485	MP65_1_1	R
1486	NDE1_1_1	F
1487	NDE1_1_1	R
1488	PFK2_1_1	F
1489	PFK2_1_1	R
1490	PHR1_1_1	F
1491	PHR1_1_1	R
1492	PHR2_1_1	F
1493	PHR2_1_1	R
1494	PHR3_1_1	F
1495	PHR3_1_1	R
1496	PRA1_1_1	F
1497	PRA1_1_1	R
1498	PRS1_1_1	F
1499	PRS1_1_1	R
1500	RBT1_1_1	F
1501	RBT1_1_1	R
1502	RBT4_1_1	F
1503	RBT4_1_1	R
1504	RHO1_1_1	F
1505	RHO1_1_1	R
1506	RNR1_1_1	F
1507	RNR1_1_1	R
1508	RPB7_1_1	F
1509	RPB7_1_1	R
1510	RPL13_1_1	F

SEQ ID NO	Probe name	Direction
1511	RPL13_1_1	R
1512	RVS167_1_1	F
1513	RVS167_1_1	R
1514	SHA3_1_1	F
1515	SHA3_1_1	R
1516	SKN1_1_1	F
1517	SKN1_1_1	R
1518	SRB1_1_1	F
1519	SRB1_1_1	R
1520	TCA1_1_1	F
1521	TCA1_1_1	R
1522	TRP1_1_1	F
1523	TRP1_1_1	R
1524	YAE1_1_1	F
1525	YAE1_1_1	R
1526	YRB1_1_1	F
1527	YRB1_1_1	R
1528	YST1exon2_1_1	F
1529	YST1exon2_1_1	R
1530	CCN1_1_1	F
1531	CCN1_1_1	R
1532	CDC28_1_1	F
1533	CDC28_1_1	R
1534	CLN2_1_1	F
1535	CLN2_1_1	R
1536	CPH1_1_1	F
1537	CPH1_1_1	R
1538	CYB1_1_1	F
1539	CYB1_1_1	R
1540	EFG1_1_1	F
1541	EFG1_1_1	R
1542	MNT1_1_1	F
1543	MNT1_1_1	R
1544	RBF1_1_1	F
1545	RBF1_1_1	R
1546	RBF1_2_1	F
1547	RBF1_2_1	R
1548	RIM101_1_1	F
1549	RIM101_1_1	R
1550	RIM8_1_1	F
1551	RIM8_1_1	R
1552	SEC14_1_1	F
1553	SEC14_1_1	R
1554	SEC4_1_1	F

SEQ ID NO	Probe name	Direction
1555	SEC4_1_1	R
1556	TUP1_1_1	F
1557	TUP1_1_1	R
1558	YPT1_1_1	F
1559	YPT1_1_1	R
1560	ZNF1CZF1_2_1	F
1561	ZNF1CZF1_2_1	R
1562	arcA_1_1	F
1563	arcA_1_1	R
1564	arcC_1_1	F
1565	arcC_1_1	R
1566	bkdA_1_1	F
1567	bkdA_1_1	R
1568	cad_1_1	F
1569	cad_1_1	R
1570	camE1_1_1	F
1571	camE1_1_1	R
1572	csrA_1_1	F
1573	csrA_1_1	R
1574	dacA_1_1	F
1575	dacA_1_1	R
1576	dfr_1_1	F
1577	dfr_1_1	R
1578	dhoD1a_1_1	F
1579	dhoD1a_1_1	R
1580	ABC-eltA_1_1	F
1581	ABC-eltA_1_1	R
1582	agrBfs_1_1	F
1583	agrBfs_1_1	R
1584	agrCfs_1_1	F
1585	agrCfs_1_1	R
1586	dnaE_1_1	F
1587	dnaE_1_1	R
1588	ebsA_1_1	F
1589	ebsA_1_1	R
1590	ebsB_1_1	F
1591	ebsB_1_1	R
1592	eep_1_1	F
1593	eep_1_1	R
1594	efaR_1_1	F
1595	efaR_1_1	R
1596	gls24_glsB_1_1	F
1597	gls24_glsB_1_1	R
1598	gph_1_1	F

SEQ ID NO	Probe name	Direction
1599	gph_1_1	R
1600	gyrAEf_1_1	F
1601	gyrAEf_1_1	R
1602	metEf_1_1	F
1603	metEf_1_1	R
1604	mntHCb2_1_1	F
1605	mntHCb2_1_1	R
1606	mob2_1_1	F
1607	mob2_1_1	R
1608	mvaD_1_1	F
1609	mvaD_1_1	R
1610	mvaE_1_1	F
1611	mvaE_1_1	R
1612	parC_1_1	F
1613	parC_1_1	R
1614	pcfG_1_1	F
1615	pcfG_1_1	R
1616	phoZ_1_1	F
1617	phoZ_1_1	R
1618	polC_1_1	F
1619	polC_1_1	R
1620	ptb_1_1	F
1621	ptb_1_1	R
1622	recS1_1_1	F
1623	recS1_1_1	R
1624	rpoN_1_1	F
1625	rpoN_1_1	R
1626	tms_1_1	F
1627	tms_1_1	R
1628	tyrDC_1_1	F
1629	tyrDC_1_1	R
1630	tyrS_1_1	F
1631	tyrS_1_1	R
1632	asa1_1_1	F
1633	asa1_1_1	R
1634	asp1_1_1	F
1635	asp1_1_1	R
1636	cgh_1_1	F
1637	cgh_1_1	R
1638	cylA_1_1	F
1639	cylA_1_1	R
1640	cylB_1_1	F
1641	cylB_1_1	R
1642	cylI_1_1	F

SEQ ID NO	Probe name	Direction
1643	cylI_1_1	R
1644	cylL_cylS_1_1	F
1645	cylL_cylS_1_1	R
1646	cylM_1_1	F
1647	cylM_1_1	R
1648	ace_1_1	F
1649	ace_1_1	R
1650	ef00108_1_1	F
1651	ef00108_1_1	R
1652	ef00109_1_1	F
1653	ef00109_1_1	R
1654	ef0011_1_1	F
1655	ef0011_1_1	R
1656	ef00113_1_1	F
1657	ef00113_1_1	R
1658	ef0012_1_1	F
1659	ef0012_1_1	R
1660	ef0022_1_1	F
1661	ef0022_1_1	R
1662	ef0031_1_1	F
1663	ef0031_1_1	R
1664	ef0032_1_1	F
1665	ef0032_1_1	R
1666	ef0040_1_1	F
1667	ef0040_1_1	R
1668	ef0058_1_1	F
1669	ef0058_1_1	R
1670	enlA_1_1	F
1671	enlA_1_1	R
1672	esa_1_1	F
1673	esa_1_1	R
1674	esp_1_1	F
1675	esp_1_1	R
1676	gelE_1_1	F
1677	gelE_1_1	R
1678	groEL_1_1	F
1679	groEL_1_1	R
1680	groES_1_1	F
1681	groES_1_1	R
1682	rt1_1_1	F
1683	rt1_1_1	R
1684	sala_1_1	F
1685	sala_1_1	R
1686	salb_1_1	F

SEQ ID NO	Probe name	Direction
1687	salb_1_1	R
1688	sea1_1_1	F
1689	sea1_1_1	R
1690	sep1_1_1	F
1691	sep1_1_1	R
1692	vicK_1_1	F
1693	vicK_1_1	R
1694	yycH_1_1	F
1695	yycH_1_1	R
1696	yycI_1_1	F
1697	yycI_1_1	R
1698	yycJ_1_1	F
1699	yycJ_1_1	R
1700	bgIB_1_1	F
1701	bgIB_1_1	R
1702	bgIR_1_1	F
1703	bgIR_1_1	R
1704	bgIS_1_1	F
1705	bgIS_1_1	R
1706	efmA_1_1	F
1707	efmA_1_1	R
1708	efmB_1_1	F
1709	efmB_1_1	R
1710	efmC_1_1	F
1711	efmC_1_1	R
1712	mreC_1_1	F
1713	mreC_1_1	R
1714	mreD_1_1	F
1715	mreD_1_1	R
1716	mvaDEfaecium_1_1	F
1717	mvaDEfaecium_1_1	R
1718	mvaEEfaecium_1_1	F
1719	mvaEEfaecium_1_1	R
1720	mvaK1Efaecium_1_1	F
1721	mvaK1Efaecium_1_1	R
1722	mvaK2Efaecium_1_1	F
1723	mvaK2Efaecium_1_1	R
1724	mvaSEfaecium_1_1	F
1725	mvaSEfaecium_1_1	R
1726	orf3_4Efaeciumb_1_1	F
1727	orf3_4Efaeciumb_1_1	R
1728	orf6_7Efaecium_1_1	F
1729	orf6_7Efaecium_1_1	R
1730	orf7_8Efaecium_1_1	F

SEQ ID NO	Probe name	Direction
1731	orf7_8Efaecium_1_1	R
1732	orf9_10Efaecium_1_1	F
1733	orf9_10Efaecium_1_1	R
1734	entA_entI_1_1	F
1735	entA_entI_1_1	R
1736	entD_1_1	F
1737	entD_1_1	R
1738	entR_1_1	F
1739	entR_1_1	R
1740	oep_1_1	F
1741	oep_1_1	R
1742	sagA_1_2	F
1743	sagA_1_2	R
1744	atsA_1_1	F
1745	atsA_1_1	R
1746	atsB_1_1	F
1747	atsB_1_1	R
1748	budC_1_1	F
1749	budC_1_1	R
1750	citA_1_1	F
1751	citA_1_1	R
1752	citW_1_1	F
1753	citW_1_1	R
1754	citX_1_1	F
1755	citX_1_1	R
1756	dalD_1_1	F
1757	dalD_1_1	R
1758	dalk_1_1	F
1759	dalk_1_1	R
1760	dalT_1_1	F
1761	dalT_1_1	R
1762	acoA_1_1	F
1763	acoA_1_1	R
1764	acoB_1_1	F
1765	acoB_1_1	R
1766	acoC_1_1	F
1767	acoC_1_1	R
1768	ahlK_1_1	F
1769	ahlK_1_1	R
1770	fimK_1_1	F
1771	fimK_1_1	R
1772	glfKPN2_1_1	F
1773	glfKPN2_1_1	R
1774	ltrA_1_1	F

SEQ ID NO	Probe name	Direction
1775	ltrA_1_1	R
1776	mdcC_1_1	F
1777	mdcC_1_1	R
1778	mdcF_1_1	F
1779	mdcF_1_1	R
1780	mdcH_1_1	F
1781	mdcH_1_1	R
1782	mrkA_1_1	F
1783	mrkA_1_1	R
1784	mtrK_1_1	F
1785	mtrK_1_1	R
1786	nifF_1_1	F
1787	nifF_1_1	R
1788	nifK_1_1	F
1789	nifK_1_1	R
1790	nifN_1_1	F
1791	nifN_1_1	R
1792	tyrP_1_1	F
1793	tyrP_1_1	R
1794	ureA_1_1	F
1795	ureA_1_1	R
1796	wbbO_1_1	F
1797	wbbO_1_1	R
1798	wza_1_1	F
1799	wza_1_1	R
1800	wzb_1_1	F
1801	wzb_1_1	R
1802	wzmKPN2_1_1	F
1803	wzmKPN2_1_1	R
1804	wztKPN2_1_1	F
1805	wztKPN2_1_1	R
1806	yohH_1_1	F
1807	yohH_1_1	R
1808	liac_1_1	F
1809	liac_1_1	R
1810	cim_1_1	F
1811	cim_1_1	R
1812	aldA_1_1	F
1813	aldA_1_1	R
1814	aldA_2_1	F
1815	aldA_2_1	R
1816	hemly_1_1	F
1817	hemly_1_1	R
1818	pSL017_1_1	F

SEQ ID NO	Probe name	Direction
1819	pSL017_1_1	R
1820	pSL020_1_1	F
1821	pSL020_1_1	R
1822	rcaA_1_1	F
1823	rcaA_1_1	R
1824	rmlC_1_1	F
1825	rmlC_1_1	R
1826	rmlD_1_1	F
1827	rmlD_1_1	R
1828	waaG_1_1	F
1829	waaG_1_1	R
1830	wbbD_1_1	F
1831	wbbD_1_1	R
1832	wbbM_1_1	F
1833	wbbM_1_1	R
1834	wbbN_1_1	F
1835	wbbN_1_1	R
1836	wbdA_1_1	F
1837	wbdA_1_1	R
1838	wbdC_1_1	F
1839	wbdC_1_1	R
1840	wztKpn_1_1	F
1841	wztKpn_1_1	R
1842	yibD_1_1	F
1843	yibD_1_1	R
1844	cymA_1_1	F
1845	cymA_1_1	R
1846	cymD_1_1	F
1847	cymD_1_1	R
1848	cymE_1_1	F
1849	cymE_1_1	R
1850	cymH_1_1	F
1851	cymH_1_1	R
1852	cymI_1_1	F
1853	cymI_1_1	R
1854	cymJ_1_1	F
1855	cymJ_1_1	R
1856	ddrA_1_1	F
1857	ddrA_1_1	R
1858	fdt-1_1_1	F
1859	fdt-1_1_1	R
1860	fdt-2_1_1	F
1861	fdt-2_1_1	R
1862	fdt-3_1_1	F

SEQ ID NO	Probe name	Direction
1863	fdt-3_1_1	R
1864	gatY_1_1	F
1865	gatY_1_1	R
1866	hydH_1_1	F
1867	hydH_1_1	R
1868	masA_1_1	F
1869	masA_1_1	R
1870	nasA_1_1	F
1871	nasA_1_1	R
1872	nasE_1_1	F
1873	nasE_1_1	R
1874	nasF_1_1	F
1875	nasF_1_1	R
1876	pehX_1_1	F
1877	pehX_1_1	R
1878	pelX_1_1	F
1879	pelX_1_1	R
1880	tagH_1_1	F
1881	tagH_1_1	R
1882	tagK_1_1	F
1883	tagK_1_1	R
1884	tagT_1_1	F
1885	tagT_1_1	R
1886	glpR_1_1	F
1887	glpR_1_1	R
1888	lasRb_1_1	F
1889	lasRb_1_1	R
1890	OrfX_1_1	F
1891	OrfX_1_1	R
1892	pa0260_1_1	F
1893	pa0260_1_1	R
1894	pa0572_1_1	F
1895	pa0572_1_1	R
1896	pa0625_1_1	F
1897	pa0625_1_1	R
1898	pa0636_1_1	F
1899	pa0636_1_1	R
1900	pa1046_1_1	F
1901	pa1046_1_1	R
1902	pa1069_1_1	F
1903	pa1069_1_1	R
1904	pa1846_1_1	F
1905	pa1846_1_1	R
1906	pa3866_1_1	F

SEQ ID NO	Probe name	Direction
1907	pa3866_1_1	R
1908	pa4082_1_1	F
1909	pa4082_1_1	R
1910	pilAp_1_1	F
1911	pilAp_1_1	R
1912	PilAp2_1_1	F
1913	PilAp2_1_1	R
1914	pilC_1_1	F
1915	pilC_1_1	R
1916	PstP_1_1	F
1917	PstP_1_1	R
1918	purK_1_1	F
1919	purK_1_1	R
1920	uvrDII_1_1	F
1921	uvrDII_1_1	R
1922	vsmI_1_1	F
1923	vsmI_1_1	R
1924	vsmR_1_2	F
1925	vsmR_1_2	R
1926	xcpX_1_1	F
1927	xcpX_1_1	R
1928	aprA_1_1	F
1929	aprA_1_1	R
1930	aprE_1_1	F
1931	aprE_1_1	R
1932	ctx_1_2	F
1933	ctx_1_2	R
1934	algB_1_1	F
1935	algB_1_1	R
1936	algN_1_1	F
1937	algN_1_1	R
1938	algR_1_1	F
1939	algR_1_1	R
1940	ExoS_1_1	F
1941	ExoS_1_1	R
1942	fpvA_1_1	F
1943	fpvA_1_1	R
1944	lasRa_1_1	F
1945	lasRa_1_1	R
1946	lipA_1_1	F
1947	lipA_1_1	R
1948	lipH_1_1	F
1949	lipH_1_1	R
1950	Orf159_1_2	F

SEQ ID NO	Probe name	Direction
1951	Orf159_1_2	R
1952	Orf252_1_1	F
1953	Orf252_1_1	R
1954	pchG_1_1	F
1955	pchG_1_1	R
1956	PhzA_1_1	F
1957	PhzA_1_1	R
1958	PhzB_1_1	F
1959	PhzB_1_1	R
1960	PLC_1_1	F
1961	PLC_1_1	R
1962	plcN_1_1	F
1963	plcN_1_1	R
1964	plcR_1_1	F
1965	plcR_1_1	R
1966	pvdD_1_1	F
1967	pvdD_1_1	R
1968	pvdF_1_2	F
1969	pvdF_1_2	R
1970	pyocinS1_1_1	F
1971	pyocinS1_1_1	R
1972	pyocinS1im_1_1	F
1973	pyocinS1im_1_1	R
1974	pyocinS2_1_1	F
1975	pyocinS2_1_1	R
1976	pys2_1_1	F
1977	pys2_1_1	R
1978	pys2_2_1	F
1979	pys2_2_1	R
1980	rbf303_1_1	F
1981	rbf303_1_1	R
1982	rhIA_1_1	F
1983	rhIA_1_1	R
1984	rhIB_1_1	F
1985	rhIB_1_1	R
1986	rhIR_1_1	F
1987	rhIR_1_1	R
1988	TnAP41_1_2	F
1989	TnAP41_1_2	R
1990	toxA_1_1	F
1991	toxA_1_1	R
1992	cap1EStrpneu_1_1	F
1993	cap1EStrpneu_1_1	R
1994	cap1FStrpneu_1_1	F

SEQ ID NO	Probe name	Direction
1995	cap1FStrpneu_1_1	R
1996	cap1GStrpneu_1_1	F
1997	cap1GStrpneu_1_1	R
1998	cap3AStrpneu_1_1	F
1999	cap3AStrpneu_1_1	R
2000	cap3BStrpneu_1_1	F
2001	cap3BStrpneu_1_1	R
2002	celAStrpneu_1_1	F
2003	celAStrpneu_1_1	R
2004	celBStrpneu_1_1	F
2005	celBStrpneu_1_1	R
2006	cglAStrpneu_1_1	F
2007	cglAStrpneu_1_1	R
2008	cglBStrpneu_1_1	F
2009	cglBStrpneu_1_1	R
2010	cglCStrpneu_1_1	F
2011	cglCStrpneu_1_1	R
2012	cglDStrpneu_1_1	F
2013	cglDStrpneu_1_1	R
2014	cinA_1_1	F
2015	cinA_1_1	R
2016	cps14EStrpneum_1_1	F
2017	cps14EStrpneum_1_1	R
2018	cps14FStrpneum_1_1	F
2019	cps14FStrpneum_1_1	R
2020	cps14GStrpneum_1_1	F
2021	cps14GStrpneum_1_1	R
2022	cps14HStrpneum_1_1	F
2023	cps14HStrpneum_1_1	R
2024	cps19aHStrpneum_1_1	F
2025	cps19aHStrpneum_1_1	R
2026	cps19aIStrpneum_1_1	F
2027	cps19aIStrpneum_1_1	R
2028	cps19aKStrpneum_1_1	F
2029	cps19aKStrpneum_1_1	R
2030	cps19fGStrpneum_1_1	F
2031	cps19fGStrpneum_1_1	R
2032	cps23fGStrpneum_1_1	F
2033	cps23fGStrpneum_1_1	R
2034	dexB_1_1	F
2035	dexB_1_1	R
2036	dinF_1_1	F
2037	dinF_1_1	R
2038	1760Strpneu_1_1	F

SEQ ID NO	Probe name	Direction
2039	1760Strpneu_1_1	R
2040	acyPStrpneu_1_1	F
2041	acyPStrpneu_1_1	R
2042	endAStrpneu_1_1	F
2043	endAStrpneu_1_1	R
2044	exoAStrpneu_1_1	F
2045	exoAStrpneu_1_1	R
2046	exp72_1_1	F
2047	exp72_1_1	R
2048	fnlAStrpneu_1_1	F
2049	fnlAStrpneu_1_1	R
2050	fnlBStrpneu_1_1	F
2051	fnlBStrpneu_1_1	R
2052	fnlCStrpneu_1_1	F
2053	fnlCStrpneu_1_1	R
2054	gct18Strpneum_1_1	F
2055	gct18Strpneum_1_1	R
2056	hexB1_1_1	F
2057	hexB1_1_1	R
2058	hftsHStrpneu_1_1	F
2059	hftsHStrpneu_1_1	R
2060	immunofrag1Strpneu_1_1	F
2061	immunofrag1Strpneu_1_1	R
2062	immunofrag2Strpneu_2_1	F
2063	immunofrag2Strpneu_2_1	R
2064	immunofrag3Strpneu_2_1	F
2065	immunofrag3Strpneu_2_1	R
2066	kdtBStrpneu_1_1	F
2067	kdtBStrpneu_1_1	R
2068	lysAStrpneu_1_1	F
2069	lysAStrpneu_1_1	R
2070	pcpBStrpneu_1_1	F
2071	pcpBStrpneu_1_1	R
2072	pflCStrpneu_1_1	F
2073	pflCStrpneu_1_1	R
2074	plpA_1_1	F
2075	plpA_1_1	R
2076	prtA1Strpneu_1_1	F
2077	prtA1Strpneu_1_1	R
2078	pspC1Strpneu_1_1	F
2079	pspC1Strpneu_1_1	R
2080	pspC2_1_1	F
2081	pspC2_1_1	R
2082	purRStrpneu_1_1	F

SEQ ID NO	Probe name	Direction
2083	purRStrpneu_1_1	R
2084	pyrDAStrpneum_1_1	F
2085	pyrDAStrpneum_1_1	R
2086	SP0828Strpneu_1_1	F
2087	SP0828Strpneu_1_1	R
2088	SP0830Strpneu_1_1	F
2089	SP0830Strpneu_1_1	R
2090	SP0833Strpneu_1_1	F
2091	SP0833Strpneu_1_1	R
2092	SP0837_38Strpneu_1_1	F
2093	SP0837_38Strpneu_1_1	R
2094	SP0839Strpneu_1_1	F
2095	SP0839Strpneu_1_1	R
2096	ugdStrpneu_1_1	F
2097	ugdStrpneu_1_1	R
2098	uncC_1_1	F
2099	uncC_1_1	R
2100	vicXStrepneu_1_1	F
2101	vicXStrepneu_1_1	R
2102	wchA6bStrpneum_1_1	F
2103	wchA6bStrpneum_1_1	R
2104	wci4Strpneum_1_1	F
2105	wci4Strpneum_1_1	R
2106	wciK4Strpneum_1_1	F
2107	wciK4Strpneum_1_1	R
2108	wciL4Strpneum_1_1	F
2109	wciL4Strpneum_1_1	R
2110	wciN6bStrpneum_1_1	F
2111	wciN6bStrpneum_1_1	R
2112	wciO6bStrpneum_1_1	F
2113	wciO6bStrpneum_1_1	R
2114	wciP6bStrpneum_1_1	F
2115	wciP6bStrpneum_1_1	R
2116	wciY18Strpneum_1_1	F
2117	wciY18Strpneum_1_1	R
2118	wzdbStrpneum_1_1	F
2119	wzdbStrpneum_1_1	R
2120	wze6bStrpneum_1_1	F
2121	wze6bStrpneum_1_1	R
2122	wzy18Strpneum_1_1	F
2123	wzy18Strpneum_1_1	R
2124	wzy4Strpneum_1_1	F
2125	wzy4Strpneum_1_1	R
2126	wzy6bStrpneum_1_1	F

SEQ ID NO	Probe name	Direction
2127	wzy6bStrpneu_1_1	R
2128	xpt_1_1	F
2129	xpt_1_1	R
2130	igaStrpneu_1_1	F
2131	igaStrpneu_1_1	R
2132	lytA_1_1	F
2133	lytA_1_1	R
2134	nanA_1_1	F
2135	nanA_1_1	R
2136	nanBStrpneu_1_1	F
2137	nanBStrpneu_1_1	R
2138	pcpCStrpneu_1_1	F
2139	pcpCStrpneu_1_1	R
2140	ply_1_1	F
2141	ply_1_1	R
2142	prtAStrpneu_1_1	F
2143	prtAStrpneu_1_1	R
2144	pspA_1_2	F
2145	pspA_1_2	R
2146	SP0834Strpneu_1_1	F
2147	SP0834Strpneu_1_1	R
2148	SP0834Strpneu_1_2	F
2149	SP0834Strpneu_1_2	R
2150	sphtraStrpneu_1_1	F
2151	sphtraStrpneu_1_1	R
2152	wciJStrpneu_1_1	F
2153	wciJStrpneu_1_1	R
2154	wziyStrpneu_1_1	F
2155	wziyStrpneu_1_1	R
2156	wzxStrpneu_1_1	F
2157	wzxStrpneu_1_1	R
2158	cpsA1Strgal_1_1	F
2159	cpsA1Strgal_1_1	R
2160	cpsB1Strgal_1_1	F
2161	cpsB1Strgal_1_1	R
2162	cpsC1Strgal_1_1	F
2163	cpsC1Strgal_1_1	R
2164	cpsD1Strgal_1_1	F
2165	cpsD1Strgal_1_1	R
2166	cpsE1Strgal_1_1	F
2167	cpsE1Strgal_1_1	R
2168	cpsG1Strgal_1_1	F
2169	cpsG1Strgal_1_1	R
2170	cpsIStragal_1_1	F

SEQ ID NO	Probe name	Direction
2171	cpsIStragal_1_1	R
2172	cpsJStragal_1_1	F
2173	cpsJStragal_1_1	R
2174	cpsKStragal_1_1	F
2175	cpsKStragal_1_1	R
2176	cpsMStragal_1_1	F
2177	cpsMStragal_1_1	R
2178	cpsYStragal_1_1	F
2179	cpsYStragal_1_1	R
2180	cpsYStragal_2_1	F
2181	cpsYStragal_2_1	R
2182	cylBStraga_1_1	F
2183	cylBStraga_1_1	R
2184	cylEStraga_1_1	F
2185	cylEStraga_1_1	R
2186	cylFStraga_1_1	F
2187	cylFStraga_1_1	R
2188	cylHStraga_1_1	F
2189	cylHStraga_1_1	R
2190	cylIStraga_1_1	F
2191	cylIStraga_1_1	R
2192	cylJStraga_1_1	F
2193	cylJStraga_1_1	R
2194	cylKStraga_1_1	F
2195	cylKStraga_1_1	R
2196	0487Straga_1_1	F
2197	0487Straga_1_1	R
2198	0488Straga_1_1	F
2199	0488Straga_1_1	R
2200	0493Straga_1_1	F
2201	0493Straga_1_1	R
2202	0495Straga_1_1	F
2203	0495Straga_1_1	R
2204	0498Straga_1_1	F
2205	0498Straga_1_1	R
2206	0500Straga_1_1	F
2207	0500Straga_1_1	R
2208	0502Straga_1_1	F
2209	0502Straga_1_1	R
2210	0504Straga_1_1	F
2211	0504Straga_1_1	R
2212	foldStraga_1_1	F
2213	foldStraga_1_1	R
2214	neuA1Strgal_1_1	F

SEQ ID NO	Probe name	Direction
2215	neuA1Strgal_1_1	R
2216	neuB1Strgal_1_1	F
2217	neuB1Strgal_1_1	R
2218	neuC1Strgal_1_1	F
2219	neuC1Strgal_1_1	R
2220	neuD1Strgal_1_1	F
2221	neuD1Strgal_1_1	R
2222	recNStraga_1_1	F
2223	recNStraga_1_1	R
2224	ileSStraga_1_1	F
2225	ileSStraga_1_1	R
2226	CAMPfactor_1_1	F
2227	CAMPfactor_1_1	R
2228	CAMPfactor_2_1	F
2229	CAMPfactor_2_1	R
2230	0499Straga_1_1	F
2231	0499Straga_1_1	R
2232	hylStragal_1_1	F
2233	hylStragal_1_1	R
2234	lipStragal_1_1	F
2235	lipStragal_1_1	R
2236	cyclStrpyog_1_1	F
2237	cyclStrpyog_1_1	R
2238	fah_rph_hlo_Strpyog_1_1	F
2239	fah_rph_hlo_Strpyog_1_1	R
2240	int_1_1	F
2241	int_1_1	R
2242	int315.5_1_1	F
2243	int315.5_1_1	R
2244	murEStrpyog_1_1	F
2245	murEStrpyog_1_1	R
2246	oppA_1_1	F
2247	oppA_1_1	R
2248	oppCStrpyog_1_1	F
2249	oppCStrpyog_1_1	R
2250	oppD_1_1	F
2251	oppD_1_1	R
2252	SPy0382Strpyog_1_1	F
2253	SPy0382Strpyog_1_1	R
2254	SPy0390Strpyog_1_1	F
2255	SPy0390Strpyog_1_1	R
2256	SpyM3_1351_1_1	F
2257	SpyM3_1351_1_1	R
2258	vicXStrpyog_1_1	F

SEQ ID NO	Probe name	Direction
2259	vicXStrpyog_1_1	R
2260	DNaseIStrpyog_1_1	F
2261	DNaseIStrpyog_1_1	R
2262	fba2Strpyog_1_1	F
2263	fba2Strpyog_1_1	R
2264	fhuAStrpyog_1_1	F
2265	fhuAStrpyog_1_1	R
2266	fhuB1Strpyog_1_1	F
2267	fhuB1Strpyog_1_1	R
2268	fhuDStrpyog_1_1	F
2269	fhuDStrpyog_1_1	R
2270	fhuGStrpyog_1_1	F
2271	fhuGStrpyog_1_1	R
2272	hylA_1_1	F
2273	hylA_1_1	R
2274	hylP_1_1	F
2275	hylP_1_1	R
2276	hylp2_1_1	F
2277	hylp2_1_1	R
2278	oppB_1_1	F
2279	oppB_1_1	R
2280	ropB_1_1	F
2281	ropB_1_1	R
2282	scpAStrpyog_1_1	F
2283	scpAStrpyog_1_1	R
2284	sloStrpyog_1_1	F
2285	sloStrpyog_1_1	R
2286	smez-4Strpyog_1_1	F
2287	smez-4Strpyog_1_1	R
2288	sof_1_1	F
2289	sof_1_1	R
2290	sof_2_1	F
2291	sof_2_1	R
2292	speA_1_1	F
2293	speA_1_1	R
2294	speB2Strpyog_1_1	F
2295	speB2Strpyog_1_1	R
2296	speCStrpyog_1_1	F
2297	speCStrpyog_1_1	R
2298	speJStrpyog_1_1	F
2299	speJStrpyog_1_1	R
2300	srtBStrpyog_1_1	F
2301	srtBStrpyog_1_1	R
2302	srtCStrpyog_1_1	F

SEQ ID NO	Probe name	Direction
2303	srtCStrpyog_1_1	R
2304	srtEStrpyog_1_1	F
2305	srtEStrpyog_1_1	R
2306	srtFStrpyog_1_1	F
2307	srtFStrpyog_1_1	R
2308	srtGStrpyog_1_1	F
2309	srtGStrpyog_1_1	R
2310	srtIStrpyog_1_1	F
2311	srtIStrpyog_1_1	R
2312	srtKStrpyog_1_1	F
2313	srtKStrpyog_1_1	R
2314	srtRStrpyog_1_1	F
2315	srtRStrpyog_1_1	R
2316	srtTStrpyog_1_1	F
2317	srtTStrpyog_1_1	R
2318	vicKStrpyog_1_1	F
2319	vicKStrpyog_1_1	R
2320	573Stprmut_1_1	F
2321	573Stprmut_1_1	R
2322	580SStprmut_1_1	F
2323	580SStprmut_1_1	R
2324	581_582SStprmut_1_1	F
2325	581_582SStprmut_1_1	R
2326	584SStprmut_1_1	F
2327	584SStprmut_1_1	R
2328	dltAStrmut_1_1	F
2329	dltAStrmut_1_1	R
2330	dltBStrmut_1_1	F
2331	dltBStrmut_1_1	R
2332	dltCpx1Strmut_1_1	F
2333	dltCpx1Strmut_1_1	R
2334	dltDStrmut_1_1	F
2335	dltDStrmut_1_1	R
2336	lichStrbov_1_1	F
2337	lichStrbov_1_1	R
2338	lytRStprmut_1_1	F
2339	lytRStprmut_1_1	R
2340	lytSStprmut_1_1	F
2341	lytSStprmut_1_1	R
2342	pepQStrrmut_1_1	F
2343	pepQStrrmut_1_1	R
2344	pflCStrmut_1_1	F
2345	pflCStrmut_1_1	R
2346	recNStprmut_1_1	F

SEQ ID NO	Probe name	Direction
2347	recNStrmut_1_1	R
2348	ytqBStrmut_1_1	F
2349	ytqBStrmut_1_1	R
2350	hlyXStrmut_1_1	F
2351	hlyXStrmut_1_1	R
2352	igaStrmitis_1_1	F
2353	igaStrmitis_1_1	R
2354	igaStrsanguis_1_1	F
2355	igaStrsanguis_1_1	R
2356	perMStrmut_1_1	F
2357	perMStrmut_1_1	R
2358	atfA_1_1	F
2359	atfA_1_1	R
2360	atfB_1_1	F
2361	atfB_1_1	R
2362	atfC_1_1	F
2363	atfC_1_1	R
2364	ccmPrmi1_1_1	F
2365	ccmPrmi1_1_1	R
2366	cyaPrmi_1_1	F
2367	cyaPrmi_1_1	R
2368	aad_1_1	F
2369	aad_1_1	R
2370	flfB_1_1	F
2371	flfB_1_1	R
2372	flfD_1_1	F
2373	flfD_1_1	R
2374	flfN_1_1	F
2375	flfN_1_1	R
2376	flhD_1_1	F
2377	flhD_1_1	R
2378	floA_1_1	F
2379	floA_1_1	R
2380	ftsK_1_1	F
2381	ftsK_1_1	R
2382	gstB_1_1	F
2383	gstB_1_1	R
2384	hemCPrmi_1_1	F
2385	hemCPrmi_1_1	R
2386	hemDPrmi_1_1	F
2387	hemDPrmi_1_1	R
2388	hev_1_1	F
2389	hev_1_1	R
2390	katA_1_1	F

SEQ ID NO	Probe name	Direction
2391	katA_1_1	R
2392	lpp1_1_1	F
2393	lpp1_1_1	R
2394	menE_1_1	F
2395	menE_1_1	R
2396	mfd_1_1	F
2397	mfd_1_1	R
2398	nrpA_1_1	F
2399	nrpA_1_1	R
2400	nrpB_1_1	F
2401	nrpB_1_1	R
2402	nrpG_1_1	F
2403	nrpG_1_1	R
2404	nrpS_1_1	F
2405	nrpS_1_1	R
2406	nrpT_1_1	F
2407	nrpT_1_1	R
2408	nrpU_1_1	F
2409	nrpU_1_1	R
2410	pat_1_1	F
2411	pat_1_1	R
2412	pmfA_1_1	F
2413	pmfA_1_1	R
2414	pmfC_1_1	F
2415	pmfC_1_1	R
2416	pmfE_1_1	F
2417	pmfE_1_1	R
2418	ppaA_1_1	F
2419	ppaA_1_1	R
2420	rsbA_1_1	F
2421	rsbA_1_1	R
2422	rsbC_1_1	F
2423	rsbC_1_1	R
2424	speB_1_1	F
2425	speB_1_1	R
2426	stmA_1_1	F
2427	stmA_1_1	R
2428	stmB_1_1	F
2429	stmB_1_1	R
2430	terA_1_1	F
2431	terA_1_1	R
2432	terD_1_1	F
2433	terD_1_1	R
2434	umoA_1_1	F

SEQ ID NO	Probe name	Direction
2435	umoA_1_1	R
2436	umoB_1_1	F
2437	umoB_1_1	R
2438	umoC_1_1	F
2439	umoC_1_1	R
2440	ureR_1_1	F
2441	ureR_1_1	R
2442	xerC_1_1	F
2443	xerC_1_1	R
2444	ygbA_1_1	F
2445	ygbA_1_1	R
2446	flaA_1_1	F
2447	flaA_1_1	R
2448	flaD_1_1	F
2449	flaD_1_1	R
2450	fliA_1_1	F
2451	fliA_1_1	R
2452	hpmA_1_1	F
2453	hpmA_1_1	R
2454	hpmB_1_1	F
2455	hpmB_1_1	R
2456	lpsPrmi_1_1	F
2457	lpsPrmi_1_1	R
2458	mrpA_1_1	F
2459	mrpA_1_1	R
2460	mrpB_1_1	F
2461	mrpB_1_1	R
2462	mrpC_1_1	F
2463	mrpC_1_1	R
2464	mrpD_1_1	F
2465	mrpD_1_1	R
2466	mrpE_1_1	F
2467	mrpE_1_1	R
2468	mrpF_1_1	F
2469	mrpF_1_1	R
2470	mrpG_1_1	F
2471	mrpG_1_1	R
2472	mrpH_1_1	F
2473	mrpH_1_1	R
2474	mrpI_1_1	F
2475	mrpI_1_1	R
2476	mrpJ_1_1	F
2477	mrpJ_1_1	R
2478	patA_1_1	F

SEQ ID NO	Probe name	Direction
2479	patA_1_1	R
2480	putA_1_1	F
2481	putA_1_1	R
2482	uca_1_1	F
2483	uca_1_1	R
2484	ureDPrmi_1_1	F
2485	ureDPrmi_1_1	R
2486	ureEPrmi_1_1	F
2487	ureEPrmi_1_1	R
2488	ureFPrmi_1_1	F
2489	ureFPrmi_1_1	R
2490	zapA_1_1	F
2491	zapA_1_1	R
2492	zapB_1_1	F
2493	zapB_1_1	R
2494	zapD_1_1	F
2495	zapD_1_1	R
2496	zapE_1_1	F
2497	zapE_1_1	R
2498	envZPrvu_1_1	F
2499	envZPrvu_1_1	R
2500	frdC_1_1	F
2501	frdC_1_1	R
2502	frdD_1_1	F
2503	frdD_1_1	R
2504	infBPrvu_1_1	F
2505	infBPrvu_1_1	R
2506	lad_1_1	F
2507	lad_1_1	R
2508	tna2_1_1	F
2509	tna2_1_1	R
2510	end_1_1	F
2511	end_1_1	R
2512	pqrA_1_1	F
2513	pqrA_1_1	R
2514	urg_1_1	F
2515	urg_1_1	R
2516	blaIMP-7_1_1	F
2517	blaIMP-7_1_1	R
2518	mecISepid_1_1	F
2519	mecISepid_1_1	R
2520	blaOXA-10_1_2	F
2521	blaOXA-10_1_2	R
2522	blaB_1_1	F

SEQ ID NO	Probe name	Direction
2523	blaB_1_1	R
2524	ampC_1_1	F
2525	ampC_1_1	R
2526	I-blaR_1_1	F
2527	I-blaR_1_1	R
2528	blaOXA-32_1_1	F
2529	blaOXA-32_1_1	R
2530	bla-CTX-M-22_1_1	F
2531	bla-CTX-M-22_1_1	R
2532	pbp2aStrpneu_1_1	F
2533	pbp2aStrpneu_1_1	R
2534	blaSHV-1_1_1	F
2535	blaSHV-1_1_1	R
2536	blaOXA-2_1_1	F
2537	blaOXA-2_1_1	R
2538	blaRShaemolyt_1_1	F
2539	blaRShaemolyt_1_1	R
2540	blaIMP-7_1_2	F
2541	blaIMP-7_1_2	R
2542	I-mecR_1_1	F
2543	I-mecR_1_1	R
2544	blaOXY_1_1	F
2545	blaOXY_1_1	R
2546	dacCStrpyog_1_1	F
2547	dacCStrpyog_1_1	R
2548	femA_1_1	F
2549	femA_1_1	R
2550	mecA_1_1	F
2551	mecA_1_1	R
2552	blaIShaemolyt_1_1	F
2553	blaIShaemolyt_1_1	R
2554	blavim_1_1	F
2555	blavim_1_1	R
2556	pbp2b_1_1	F
2557	pbp2b_1_1	R
2558	pbp2primeSepid_1_1	F
2559	pbp2primeSepid_1_1	R
2560	pbp2x_1_1	F
2561	pbp2x_1_1	R
2562	pbp3Saureuc_1_1	F
2563	pbp3Saureuc_1_1	R
2564	pbp4_1_1	F
2565	pbp4_1_1	R
2566	pbp5Efaecium_1_1	F

SEQ ID NO	Probe name	Direction
2567	pbp5Efaecium_1_1	R
2568	pbpC_1_1	F
2569	pbpC_1_1	R
2570	I-mecI_1_1	F
2571	I-mecI_1_1	R
2572	pbp1a_1_1	F
2573	pbp1a_1_1	R
2574	I-blaI_1_1	F
2575	I-blaI_1_1	R
2576	blaTEM-106_1_1	F
2577	blaTEM-106_1_1	R
2578	blaOXY-KLOX_1_1	F
2579	blaOXY-KLOX_1_1	R
2580	ftsWEF_1_1	F
2581	ftsWEF_1_1	R
2582	fmhB_1_1	F
2583	fmhB_1_1	R
2584	cumA_1_1	F
2585	cumA_1_1	R
2586	femBShaemolyt_1_1	F
2587	femBShaemolyt_1_1	R
2588	blaPER-1_1_1	F
2589	blaPER-1_1_1	R
2590	bla_FOX-3_1_1	F
2591	bla_FOX-3_1_1	R
2592	blaA_1_1	F
2593	blaA_1_1	R
2594	psrb_1_1	F
2595	psrb_1_1	R
2596	fmhA_1_1	F
2597	fmhA_1_1	R
2598	mecR1Sepid_1_1	F
2599	mecR1Sepid_1_1	R
2600	blaZ_1_1	F
2601	blaZ_1_1	R
2602	blaOXA-1_1_1	F
2603	blaOXA-1_1_1	R
2604	fox-6_1_1	F
2605	fox-6_1_1	R
2606	blaPrmi_1_1	F
2607	blaPrmi_1_1	R
2608	aacA_aphDStwar_1_1	F
2609	aacA_aphDStwar_1_1	R
2610	aacC1_1_2	F

SEQ ID NO	Probe name	Direction
2611	aacC1_1_2	R
2612	aacC2_1_1	F
2613	aacC2_1_1	R
2614	strB_1_1	F
2615	strB_1_1	R
2616	aadA_1_1	F
2617	aadA_1_1	R
2618	aadB_1_2	F
2619	aadB_1_2	R
2620	aadD_1_1	F
2621	aadD_1_1	R
2622	aacA4_1_2	F
2623	aacA4_1_2	R
2624	strA_1_1	F
2625	strA_1_1	R
2626	aph-A3_1_1	F
2627	aph-A3_1_1	R
2628	aacC1_1_1	F
2629	aacC1_1_1	R
2630	aacA4_1_1	F
2631	aacA4_1_1	R
2632	aacA-aphD_1_1	F
2633	aacA-aphD_1_1	R
2634	I-spc_1_1	F
2635	I-spc_1_1	R
2636	aphA3_1_1	F
2637	aphA3_1_1	R
2638	ermC_1_1	F
2639	ermC_1_1	R
2640	linB_1_1	F
2641	linB_1_1	R
2642	satSA_1_1	F
2643	satSA_1_1	R
2644	mdrSA_1_1	F
2645	mdrSA_1_1	R
2646	I-linA_1_1	F
2647	I-linA_1_1	R
2648	ermB_1_2	F
2649	ermB_1_2	R
2650	ermA_1_1	F
2651	ermA_1_1	R
2652	satA_1_1	F
2653	satA_1_1	R
2654	msrA_1_1	F

SEQ ID NO	Probe name	Direction
2655	msrA_1_1	R
2656	mphBM_1_1	F
2657	mphBM_1_1	R
2658	mefA_1_1	F
2659	mefA_1_1	R
2660	mrx_1_1	F
2661	mrx_1_1	R
2662	dfrStrpneu_1_1	F
2663	dfrStrpneu_1_1	R
2664	dfrA_1_1	F
2665	dfrA_1_1	R
2666	cmlA5_1_1	F
2667	cmlA5_1_1	R
2668	catEfaecium_1_1	F
2669	catEfaecium_1_1	R
2670	cat_1_1	F
2671	cat_1_1	R
2672	tetAJ_1_1	F
2673	tetAJ_1_1	R
2674	tetL_1_1	F
2675	tetL_1_1	R
2676	tetM_1_1	F
2677	tetM_1_1	R
2678	vanH(tn)_1_1	F
2679	vanH(tn)_1_1	R
2680	vanA_1_1	F
2681	vanA_1_1	R
2682	vanHB2_1_1	F
2683	vanHB2_1_1	R
2684	vanR_1_1	F
2685	vanR_1_1	R
2686	vanRB2_1_1	F
2687	vanRB2_1_1	R
2688	vanS(tn)_1_1	F
2689	vanS(tn)_1_1	R
2690	vanSB2_1_1	F
2691	vanSB2_1_1	R
2692	vanWB2_1_1	F
2693	vanWB2_1_1	R
2694	ddl_1_1	F
2695	ddl_1_1	R
2696	ble_1_1	F
2697	ble_1_1	R
2698	vanXB2_1_1	F

SEQ ID NO	Probe name	Direction
2699	vanXB2_1_1	R
2700	vanY(tn)_1_1	F
2701	vanY(tn)_1_1	R
2702	vanYB2_1_1	F
2703	vanYB2_1_1	R
2704	vanB_1_1	F
2705	vanB_1_1	R
2706	vanZ(tn)_1_1	F
2707	vanZ(tn)_1_1	R
2708	vanC-2_1_1	F
2709	vanC-2_1_1	R
2710	vanX(tn)_1_1	F
2711	vanX(tn)_1_1	R
2712	acrB_1_1	F
2713	acrB_1_1	R
2714	mexB_1_2	F
2715	mexB_1_2	R
2716	I-qacA_1_1	F
2717	I-qacA_1_1	R
2718	sulI_1_1	F
2719	sulI_1_1	R
2720	sul_1_1	F
2721	sul_1_1	R
2722	cadBStalugd_1_1	F
2723	cadBStalugd_1_1	R
2724	mexA_1_1	F
2725	mexA_1_1	R
2726	acrR_1_1	F
2727	acrR_1_1	R
2728	emeA_1_1	F
2729	emeA_1_1	R
2730	acrA_1_1	F
2731	acrA_1_1	R
2732	rtn_1_1	F
2733	rtn_1_1	R
2734	abcXStrpmut_1_1	F
2735	abcXStrpmut_1_1	R
2736	qacEdelta1_1_1	F
2737	qacEdelta1_1_1	R
2738	elkT-abcA_1_1	F
2739	elkT-abcA_1_1	R
2740	I-cadA_1_1	F
2741	I-cadA_1_1	R
2742	albA_1_1	F

SEQ ID NO	Probe name	Direction
2743	albA_1_1	R
2744	wzm_1_1	F
2745	wzm_1_1	R
2746	msrCb_1_1	F
2747	msrCb_1_1	R
2748	nov_1_1	F
2749	nov_1_1	R
2750	wzt_1_1	F
2751	wzt_1_1	R
2752	wbbI_1_1	F
2753	wbbI_1_1	R
2754	norA23_1_1	F
2755	norA23_1_1	R
2756	mexR_1_1	F
2757	mexR_1_1	R
2758	arr2_1_1	F
2759	arr2_1_1	R
2760	mreA_1_1	F
2761	mreA_1_1	R
2762	I-cadC_1_1	F
2763	I-cadC_1_1	R
2764	uvrA_1_1	F
2765	uvrA_1_1	R
2766	CRD2_1_1	F
2767	CRD2_1_1	R
2768	CDR1_1_1	F
2769	CDR1_1_1	R
2770	CDR1_2_1	F
2771	CDR1_2_1	R
2772	MET3_1_1	F
2773	MET3_1_1	R
2774	FET3_1_1	F
2775	FET3_1_1	R
2776	FTR2_1_1	F
2777	FTR2_1_1	R
2778	MDR1-7_1_1	F
2779	MDR1-7_1_1	R
2780	ERG11_1_1	F
2781	ERG11_1_1	R
2782	SEC20_1_1	F
2783	SEC20_1_1	R
2784	rbcL_1_1	F
2785	rbcL_1_1	R
2786	LDHA(hu)_1_1	F

SEQ ID NO	Probe name	Direction
2787	LDHA(hu)_1_1	R
2788	GAPD(hu)_1_1	F
2789	GAPD(hu)_1_1	R
2790	b-Act(hu)_1_1	F
2791	b-Act(hu)_1_1	R
2792	ARHGDIA(hu)_1_1	F
2793	ARHGDIA(hu)_1_1	R
2794	PGK1(hu)_1_1	F
2795	PGK1(hu)_1_1	R
2796	rbcL_1_2	F
2797	rbcL_1_2	R
2798	16SPa_1_1	F
2799	16SPa_1_1	R
2800	23SEfaecium_2_1	F
2801	23SEfaecium_2_1	R
2802	16SStrepyog_1_1	F
2803	16SStrepyog_1_1	R
2804	16SStrepneu_1_1	F
2805	16SStrepneu_1_1	R
2806	16SStrepagalactiae_1_1	F
2807	16SStrepagalactiae_1_1	R
2808	16SEfaecium_1_1	F
2809	16SEfaecium_1_1	R
2810	16SEfaecium_2_1	F
2811	16SEfaecium_2_1	R
2812	16SRNAEf_2_1	F
2813	16SRNAEf_2_1	R
2814	16SKpn_1_1	F
2815	16SKpn_1_1	R
2816	16SSa_3_1	F
2817	16SSa_3_1	R
2818	16SRNAEf_1_1	F
2819	16SRNAEf_1_1	R
2820	16SShominis_1_1	F
2821	16SShominis_1_1	R
2822	16SShaemolyt_1_1	F
2823	16SShaemolyt_1_1	R
2824	23SEfaecium_1_1	F
2825	23SEfaecium_1_1	R
2826	16SrRNAPrmi_1_1	F
2827	16SrRNAPrmi_1_1	R
2828	16SrRNAPrvu1_1_1	F
2829	16SrRNAPrvu1_1_1	R
2830	16SSa_1_1	F

SEQ ID NO	Probe name	Direction
2831	16SSa_1_1	R
2832	16SKlox_1_1	F
2833	16SKlox_1_1	R
2834	p53_1_1	F
2835	p53_1_1	R
2836	0135mihck_1_1	F
2837	0135mihck_1_1	R
2838	FAN_1_1	F
2839	FAN_1_1	R
2840	0270cap_1_1	F
2841	0270cap_1_1	R
2909	16SStrepdysgal_1_1	F
2910	16SStrepdysgal_1_1	R
2911	carO_1_1	F
2912	carO_1_1	R
2913	gacS_1_1	F
2914	gacS_1_1	R
2915	dhbA_1_1	F
2916	dhbA_1_1	R
2917	dhbB_1_1	F
2918	dhbB_1_1	R
2919	sid_1_1	F
2920	sid_1_1	R
2921	csuD_1_1	F
2922	csuD_1_1	R
2923	csuC_1_1	F
2924	csuC_1_1	R
2925	tnp-ACIBA_1_1	F
2926	tnp-ACIBA_1_1	R
2927	waaA-ACIBA_1_1	F
2928	waaA-ACIBA_1_1	R
2929	csuB_1_1	F
2930	csuB_1_1	R
2931	csuA_B_1_1	F
2932	csuA_B_1_1	R
2933	csuA_1_1	F
2934	csuA_1_1	R
2935	put1_1_1	F
2936	put1_1_1	R
2937	por_1_1	F
2938	por_1_1	R
2939	abc_1_1	F
2940	abc_1_1	R
2941	furACIBA_1_1	F

SEQ ID NO	Probe name	Direction
2942	furACIBA_1_1	R
2943	dec_1_1	F
2944	dec_1_1	R
2945	cysI_1_1	F
2946	cysI_1_1	R
2947	trpE_1_1	F
2948	trpE_1_1	R
2949	put3_1_1	F
2950	put3_1_1	R
2951	ompA-ACIBA_1_1	F
2952	ompA-ACIBA_1_1	R
2953	aacA4ENCL_1_1	F
2954	aacA4ENCL_1_1	R
2955	AdeR-ACIBA_1_1	F
2956	AdeR-ACIBA_1_1	R
2957	adeA-ACIBA_1_1	F
2958	adeA-ACIBA_1_1	R
2959	aac(6p)-lb7_1_1	F
2960	aac(6p)-lb7_1_1	R
2961	adeB-ACIBA_1_1	F
2962	adeB-ACIBA_1_1	R
2963	adeC-ACIBA_1_1	F
2964	adeC-ACIBA_1_1	R
2965	AdeS-ACIBA_1_1	F
2966	AdeS-ACIBA_1_1	R
2967	blaL2_1_1	F
2968	blaL2_1_1	R
2969	blaMIR-3_1_1	F
2970	blaMIR-3_1_1	R
2971	ampR_1_1	F
2972	ampR_1_1	R
2973	ampC-ENCL_1_1	F
2974	ampC-ENCL_1_1	R
2975	blaL1_1_1	F
2976	blaL1_1_1	R
2977	asr_1_1	F
2978	asr_1_1	R
2979	lacZ_1_1	F
2980	lacZ_1_1	R
2981	ehuS_1_1	F
2982	ehuS_1_1	R
2983	ehuV_1_1	F
2984	ehuV_1_1	R
2985	slyA_1_1	F

SEQ ID NO	Probe name	Direction
2986	slyA_1_1	R
2987	ORF165_1_1	F
2988	ORF165_1_1	R
2989	ehuU_1_1	F
2990	ehuU_1_1	R
2991	ehuT_1_1	F
2992	ehuT_1_1	R
2993	ORF295_1_1	F
2994	ORF295_1_1	R
2995	ehuA_1_1	F
2996	ehuA_1_1	R
2997	ORF400_1_1	F
2998	ORF400_1_1	R
2999	H+ATPase_1_1	F
3000	H+ATPase_1_1	R
3001	sulII_1_1	F
3002	sulII_1_1	R
3003	smeE_1_1	F
3004	smeE_1_1	R
3005	eE_1_1	F
3006	eE_1_1	R
3007	StmPr1_1_1	F
3008	StmPr1_1_1	R
3009	eD_2_1	F
3010	eD_2_1	R
3011	ppi_1_1	F
3012	ppi_1_1	R
3013	pmp-STEMA_1_1	F
3014	pmp-STEMA_1_1	R
3015	pam_1_1	F
3016	pam_1_1	R
3017	ORF4-STEMA_1_1	F
3018	ORF4-STEMA_1_1	R
3019	ORF2-STEMA_1_1	F
3020	ORF2-STEMA_1_1	R
3021	et_1_1	F
3022	et_1_1	R
3023	eF_1_1	F
3024	eF_1_1	R
3025	StmPr2_1_1	F
3026	StmPr2_1_1	R
3027	smeF4494_1_1	F
3028	smeF4494_1_1	R
3029	coa_3_1	F

SEQ ID NO	Probe name	Direction
3030	coa_3_1	R
3031	coa_2_2	F
3032	coa_2_2	R
3033	fasCAXStrdysg_1_1	F
3034	fasCAXStrdysg_1_1	R
3035	sloStrep_1_1	F
3036	sloStrep_1_1	R
3037	ydhK_1_1	F
3038	ydhK_1_1	R
3039	tetA-ACIBA_1_1	F
3040	tetA-ACIBA_1_1	R
3041	tetR-ACIBA_1_1	F
3042	tetR-ACIBA_1_1	R

Claims

1. An analytical device for direct identification and characterisation of microorganisms in a sample or clinical specimen, wherein the analytical device comprises species specific gene probes which are (i) selected from DNA sequences
5 or partial DNA sequences of the microorganisms to be identified or DNA sequences complementary or homologous thereto, and (ii) have a length of at least 100 nucleotides (nt).
2. The analytical device of claim 1, which is a DNA coated bead, a set of DNA coated beads, or a DNA microarray, preferably a DNA microarray.
- 10 3. The analytical device of claim 1 or 2 which is suitable for species specific identification of one microbial strain or a plurality of microbial strains in clinical specimens comprising microbial strains, especially bacteria and/or fungi, and which furthermore allows differentiation of the target species from each other and from non-target-species contained in one sample comprising a plurality of microbial
15 strains.
4. The analytical device of claim 3 which is suitable for species specific identification of microorganisms causing bacteremia, fungemia or sepsis in a clinical sample.
5. The analytical device of any one of claims 1 to 4, wherein the device is suitable for species specific identification of microorganisms selected from the group
20 consisting of Staphylococci, *E. coli* and Candida sp., preferably for species specific identification of Staphylococci.
6. The analytical device of any one of claims 1 to 5, which is suitable for species specific identification of microorganisms selected from the group consisting of *Staphylococcus aureus*, *Escherichia coli*, CoNS (including *Staphylococcus epidermidis*,
25 *Staphylococcus haemolyticus*, *Staphylococcus lugdunensis*, *Staphylococcus warneri*, *Staphylococcus saprophyticus*), *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Pseudomonas aeruginosa*, *Streptococcus agalactiae*, *Streptococcus mutans*, *Enterococcus faecalis*, *Enterococcus faecium*, *Proteus mirabilis*, *Proteus vulgaris*,
30 *Candida albicans*, *Acinetobacter baumannii*.
7. The analytical device of claim 6, wherein the device is suitable for species specific identification of at least *S. aureus* and preferably comprises gene probes

selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903, more preferably from SEQ ID NO:4, 68, 69 and 71, even more preferably comprises at least SEQ ID NO:71.

8. The analytical device of claim 6 or 7, wherein the device is suitable for species specific identification of at least *S. aureus*, *E. coli*, CoNS, *Enterococcus* sp., and/or *Candida* sp., and preferably comprises gene probes selected from

a) SEQ ID NO:4, 68, 69 and 71, preferably SEQ ID NO: 71 for identification of *S. aureus*;

b) SEQ ID NO: 145, 160, 161 and 170, preferably SEQ ID NO:145 for identification of *E. coli*;

c) SEQ ID NO:177, 178 and 190, preferably SEQ ID NO:178 for identification of *S. epidermidis*;

d) SEQ ID NO:60, 61, 70, 72, 78 and 125, preferably SEQ ID NO:78 for identification of the genus *Staphylococci* including *S. aureus*;

e) SEQ ID NO:210, 224 and 2906, preferably 2906 for identification of CoNS;

f) SEQ ID NO:308, 310 and 314, preferably SEQ ID NO:310 for identification of *Enterococcus faecalis*;

g) SEQ ID NO:380 and 385, preferably SEQ ID NO:380 for identification of *Enterococcus faecium*;

h) SEQ ID NO:232 and 249, preferably SEQ ID NO:249 for identification of *Candida albicans*;

respectively.

9. The analytical device of claim 8, which is suitable for species specific detection or differentiation of

(i) *S. aureus* and comprises SEQ ID NO:71;

(ii) CoNS and comprises SEQ ID NO:2906;

(iii) *E. coli* and comprises SEQ ID NO:145; and/or

(iv) *Candida albicans* and comprises SEQ ID NO:249.

10. The analytical device of any one of claims 7 to 9, which is suitable for additional species specific identification or differentiation of one or more of *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Proteus mirabilis* and *Proteus vulgaris*.

5 11. The analytical device of any one of claims 1 to 10, which additionally comprises virulence and/or resistance gene probes.

12. The analytical device of any one of claims 1 to 11, wherein

(i) the length of the gene probes is from 100 to 1000 nt, preferably from 200 to 800 nt; and/or

10 (ii) specific gene probes are present for each specific microbial species or group of microorganisms to be identified or differentiated, which gene probes preferably are DNA sequences selected from the groups consisting of (a) species specific gene probes, (b) virulence gene probes and (c) resistance gene probes; and/or

15 (iii) the sample is selected from whole blood, serum, urine, saliva, liquor, sputum, punktate, stool, pus, wound fluid, swabs, positive blood cultures, preferably is positive blood cultures; and/or

(iv) the device further comprises DNA sequences selected from the group (d) consisting of control gene probes coding for negative controls and positive controls.

13. The analytical device of claim 3, which is suitable for diagnosis of

20 (i) bacteremia, fungemia or sepsis, wherein the device preferably comprises probes for species specific identification of at least *S. aureus*, *E. coli*, CoNS, *Enterococcus* sp., and *Candida* sp.;

25 (ii) respiratory tract infections, wherein the device preferably comprises probes for species specific identification of at least *Candida* sp., *S. aureus* and *P. aeruginosa*; and/or

(iii) urinary tract infenctions, wherein the device preferably comprises probes for species specific identification of at least *E. coli*, *Enterococci* sp., *Candida* sp. and *Proteus* sp..

30 14. The analytical device of any one of claims 1 to 13, wherein the set of gene probes preferably comprises gene probes selected from

(a) species specific gene probes for

(i) *Staphylococcus aureus* including gene probes derived from *clfA*, *clfB*, *coa*, *lytM*, *NAG*, *sodA*, *sodB*, *epiP-bsaP*, *geh*, *hemC*, *hemD*, *hsdS*, *lip*, *menC*, *nuc*, *SAV0431*, *SAV0440*, *SAV0441*, *spa*, *ebpS*, *fbpA*, *fib*, *fnbB*, *srtA*, *fnbA*, *femA*, *fmhB*,
5 *fmhA*;

(ii) *Escherichia coli* including gene probes derived *b1169*, *fliCb*, *nfrB*, *yach*, *ycdS*, *yciQ*, *shuA*;

(iii) *Staphylococcus epidermidis* including gene probes derived from *ardeSE0106*, *ardeSE0107*, *atlE*, *agrB*, *alphSE1368*, *gad*, *glucSE1191*, *icaB*, *mvaSSepid*,
10 *nitreSE1972*, *nitreSE1974*, *nitreSE1975*, *oiamtSE1209*, *ORF1Sepid*, *ORF3bSepid*, *qacR*, *ureSE1865*, *ureSE1867*;

(iv) *Staphylococcus haemolyticus* including gene probes derived from *femBShaemolyt*, *mvaDShaemolyt*, *mvaSShaemolyticus*, *RNApolsigm*;

(v) *Staphylococcus lugdunensis* including gene probes derived from *agrB2Stalugd*,
15 *agrC2Stalugd*, *slamStalugd*;

(vi) *Staphylococcus warneri* including gene probes derived from *msrw1Stwar*, *nukMStwar*, *proDStwar*, *proMStwar*, *sigrpoStwar*, *tnpStwar*;

(vii) *Staphylococcus saprophyticus* including gene probes derived from *RNApolsigmSsapro*;

20 (viii) *Staphylococcus hominis* including gene probes derived from *ydhK*;

(ix) *Candida albicans* including gene probes derived from *ARG56*, *ASL43f*, *BGL2*, *CCT8*, *CDC37*, *CEF3*, *CHS1*, *CHS2*, *CHS4*, *CHS5*, *CHT1*, *CHT2*, *CHT4*, *CSA1*, *5triphosphatase*, *AAF1*, *ADH1*, *ALS1*, *ALS7*, *EDT1*, *ELF*, *ESS1*, *FAL1*, *GAP1*, *GNA1*, *GSC1*, *GSL1*, *HIS1*, *HTS1*, *HWP1*, *HYR1*, *INT1a*, *KRE15f*, *KRE6*, *KRE9*, *MIG1*, *MLS1*,
25 *MP65*, *NDE1*, *PFK2*, *PHR1*, *PHR2*, *PHR3*, *PRA1*, *PRS1*, *RBT1*, *RBT4*, *RHO1*, *RNR1*, *RPB7*, *RPL13*, *RVS167*, *SHA3*, *SKN1*, *SRB1*, *TCA1*, *TRP1*, *YAE1*, *YRB1*, *YST1exon2*;

(x) *Enterococcus faecalis* including gene probes derived from *arcA*, *arcC*, *bkdA*, *camE1*, *csrA*, *dacA*, *dfr*, *dhoD1a*, *ABC-eltA*, *agrBfs*, *agrCfs*, *dnaE*, *ebsA*, *ebsB*, *eep*, *efaR*, *gls24_glsB*, *gph*, *gyrAEf*, *metEf*, *mntHCB2*, *mob2*, *mvaD*, *mvaE*, *parC*, *pcfG*,
30 *phoZ*, *polC*, *ptb*, *recS1*, *rpoN*, *tms*, *tyrDC*, *tyrS*;

(xi) *Enterococcus faecium* including gene probes derived from *bglB*, *bglR*, *bglS*, *efmA*, *efmB*, *efmC*, *mreC*, *mreD*, *mvaDEfaecium*, *mvaEEfaecium*, *mvaK1Efaecium*, *mvaK2Efaecium*, *mvaSEfaecium*, *orf3_4Efaeciumb*, *orf6_7Efaecium*, *orf7_8Efaecium*, *orf9_10Efaecium*;

5 (xii) *Klebsiella pneumonia* including gene probes derived from *atsA*, *budC*, *citA*, *citW*, *citX*, *dalk*, *acoA*, *acoB*, *acoC*, *ahlK*, *fimK*, *glfKPN2*, *ltrA*, *mdcC*, *mdcH*, *nifF*, *nifK*, *nifN*, *tyrP*, *wbbO*, *wzb*, *wzmKPN2*, *wztKPN2*, *yojH*, *liac*;

(xiii) *Klebsiella oxytoca* including gene probes derived from *gatY*, *pelX*, *tagH*, *tagK*, *tagT*;

10 (xvi) *Pseudomonas aeruginosa* including gene probes derived from *glpR*, *lasRb*, *OrfX*, *pa0260*, *pa0572*, *pa0625*, *pa0636*, *pa1046*, *pa1069*, *pa1846*, *pa3866*, *pa4082*, *pilAp*, *PilAp2*, *pilC*, *PstP*, *uvrDII*, *vsmI*, *vsmR*, *xcpX*;

(xv) *Streptococcus pneumoniae* including gene probes derived from *cap1EStrpneu*, *cap1FStrpneu*, *cap1GStrpneu*, *cap3AStrpneu*, *cap3BStrpneu*, *celAStrpneu*,
 15 *celBStrpneu*, *cglAStrpneu*, *cglBStrpneu*, *cglCStrpneu*, *cglDStrpneu*, *cinA*, *cps14EStrpneu*, *cps14FStrpneu*, *cps14GStrpneu*, *cps14HStrpneu*, *cps19aHStrpneu*, *cps19aIStrpneu*, *cps19aKStrpneu*, *cps19fGStrpneu*, *cps23fGStrpneu*, *dexB*, *dinF*, *1760Strpneu*, *acyPStrpneu*, *endAStrpneu*, *exoAStrpneu*, *exp72*, *fnlAStrpneu*, *fnlBStrpneu*, *fnlCStrpneu*, *gct18Strpneu*,
 20 *hexB1*, *hftsHstrpneu*, *immunofrag1Strpneu*, *immunofrag2Strpneu*, *immunofrag3Strpneu*, *kdtBStrpneu*, *lysAStrpneu*, *pcpBStrpneu*, *pflCStrpneu*, *plpA*, *prtA1Strpneu*, *pspC1Strpneu*, *pspC2*, *purRStrpneu*, *pyrDAStrpneu*, *SP0828Strpneu*, *SP0830Strpneu*, *SP0833Strpneu*, *SP0837_38Strpneu*, *SP0839Strpneu*, *ugdStrpneu*, *uncC*, *vicXStrpneu*, *wchA6bStrpneu*,
 25 *wci4Strpneu*, *wciK4Strpneu*, *wciL4Strpneu*, *wciN6bStrpneu*, *wciO6bStrpneu*, *wciP6bStrpneu*, *wciY18Strpneu*, *wzdbStrpneu*, *wze6bStrpneu*, *wzy18Strpneu*, *wzy4Strpneu*, *wzy6bStrpneu*, *xpt*;

(xvi) *Streptococcus agalactiae* including gene probes derived from *cpsA1Strgal*, *cpsB1Strgal*, *cpsC1Strgal*, *cpsD1Strgal*, *cpsE1Strgal*, *cpsG1Strgal*, *cpsIStrgal*,
 30 *cpsJStrgal*, *cpsKStrgal*, *cpsMStrgal*, *cpsYStrgal*, *cylBStraga*, *cylEStraga*, *cylFStraga*, *cylHStraga*, *cylIStraga*, *cylJStraga*, *cylKStraga*, *0487Straga*, *0488Straga*, *0493Straga*, *0495Straga*, *0498Straga*, *0500Straga*, *0502Straga*,

0504Straga, foldStraga, neuA1Strgal, neuB1Strgal, neuC1Strgal, neuD1Strgal, recNStraga, ileSStraga;

(xvii) *Streptococcus pyogenes* including gene probes derived from *cyclStrpyog, fah_rph_hlo_Strpyog, int, int315.5, oppD, , SpyM3_1351, vicXStrpyog;*

5 (xviii) *Streptococcus mutans* including gene probes derived from *573Stprmut, 580SStprmut, 581_582SStprmut, 584SStprmut, dltAStrmut, dltBStrmut, dltCpplx1Strmut, dltDStrmut, lichStrbov, lytRStprmut, lytSStprmut, pepQStrrmut, pflCStrmut, recNStprmut, ytqBStrmut;*

10 (xix) *Proteus mirabilis* including gene probes derived from *atfA, atfB, atfC, ccmPrmi1, cyaPrmi, flfB, flfD, flfN, flhD, floA, ftsK, gstB, hemCPrmi, hemDPrmi, hev, katA, lpp1, menE, mfd, nrpA, nrpB, nrpG, nrpS, nrpT, nrpU, pat, pmfA, pmfC, pmfE, ppaA, rsbA, rsbC, speB, stmA, stmB, terA, umoA, umoB, umoC, ureR, xerC, ygbA;*

15 (xx) *Proteus vulgaris* including gene probes derived from *envZPrvu, frdC, frdD, lad, tna2;*

(xxi) *Acinetobacter baumanii* including gene probes derived from *carO, gacS, dhbA, dhbB, sid, csuD, csuC, tnp-ACIBA, waaA-ACIBA, csuB, csuA_B, csuA, put1, por, abc, furACIBA, dec, cysI, trpE, put3, ompA-ACIBA; and/or*

(b) virulence gene probes for

20 (i) *Staphylococcus aureus* including gene probes derived from *bsaE, bsaG, cap5h, cap5i, cap5j, cap5k, cap8H, cap8I, cap8J, cap8K, I-hld, I-hysA, I-IgGbg, EDIN, eta, etb, hglA, hglB, hglC, hla, hlb, lukF, lukS, NAG, sak, sea, seb, sec1, seg, seh, sel, set15, set6, set7, set8, sprV8, tst, I-sdrC, I-sdrD, I-sdrE;*

25 (ii) *Escherichia coli* including gene probes derived from *b1202, eae, eltB, escR, escT, escU, espB, fes, fteA, hlyA, hlyB, iucA, iucB, iucC, papG, rfbE, shuA, SLTII, toxA-LTPA, VT2vaB;*

(iii) *Staphylococcus epidermidis* including gene probes derived from *gcaD, hld_orf5, icaC, icaD, icaR, psm_beta1and2, purR, spoVG, yabJ;*

(iv) *Staphylococcus haemolyticus* including gene probes derived from *lipShaemolyt;*

30 (v) *Staphylococcus lugdunensis* including gene probes derived from *fblStalugd, slushABCStalugd;*

- (vi) *Staphylococcus warneri* including gene probes derived from *gehAStwar*;
- (vii) *Candida albicans* including gene probes derived from *CCN1, CDC28, CLN2, CPH1, CYB1, EFG1, MNT1, RBF1, RBF1, RIM101, RIM8, SEC14, SEC4, TUP1, YPT1, ZNF1CZF1*;
- 5 (viii) *Enterococcus faecalis* including gene probes derived from *asa1, asp1, cgh, cylA, cylB, cylI, cylL_cylS, cylM, ace, ef00108, ef00109, ef00111, ef00113, ef0012, ef0022, ef0031, ef0032, ef0040, ef0058, enlA, esa, esp, gelE, groEL, groES, rt1, sala, salb, sea1, sep1, vick, yych, yycI, yycJ*;
- 10 (ix) *Enterococcus faecium* including gene probes derived from *entA_entI, entD, entR, oep, sagA*;
- (x) *Klebsiella pneumoniae* including gene probes derived from *cim, aldA, hemly, pSL017, pSL020, rcsA, rmlC, rmlD, waaG, wbbD, wbbM, wbbN, wbdA, wbdC, wztKpn, yibD*;
- 15 (xi) *P. aeruginosa* including gene probes derived from *aprA, aprE, ctx, algB, algN, algR, ExoS, fpvA, lasRa, lipA, lipH, Orf159, Orf252, pchG, PhzA, PhzB, PLC, plcN, plcR, pvdD, pvdF, pyocinS1, pyocinS1im, pyocinS2, pys2, rbf303, rhlA, rhlB, rhlR, TnAP41, toxA*;
- 20 (xii) *Streptococcus pneumoniae* including gene probes derived from *igaStrpneu, lytA, nanA, nanBStrpneu, pcpCStrpneu, ply, prtAStrpneu, pspA, SP0834Strpneu, sphtraStrpneu, wciJStrpneu, wzlyStrpneu, wzxStrpneu*;
- (xiii) *Streptococcus agalactiae* including gene probes derived from *CAMPfactor, 0499Straga, hylStragal, lipStragal*;
- 25 (xiv) *Streptococcus pyogenes* including gene probes derived from *DNaseIStrpyog, fba2Strpyog, fhuAStrpyog, fhuB1Strpyog, fhuDStrpyog, fhuGStrpyog, hylA, hylP, hylp2, oppB, ropB, scpAStrpyog, sloStrpyog, smez- Strpyog, sof, speA, speB2Strpyog, speCStrpyog, speJStrpyog, srtBStrpyog, srtCStrpyog, srtEStrpyog, srtFStrpyog, srtGStrpyog, srtIStrpyog, srtKStrpyog, srtRStrpyog, srtTStrpyog, vickStrpyog*;
- 30 (xvi) *Streptococcus mutans* including gene probes derived from *hlyXStrmut, perMStrmut*;

(xvii) *Proteus mirabilis* including gene probes derived from *flaA*, *laD*, *fliA*, *hpmA*, *hpmB*, *lpsPrmi*, *mrpA*, *mrpB*, *mrpC*, *mrpD*, *mrpE*, *mrpF*, *mrpG*, *mrpH*, *mrpI*, *mrpJ*, *patA*, *putA*, *uca*, *ureDPrmi*, *ureEPrmi*, *ureFPrmi*, *zapA*, *zapB*, *zapD*, *zapE*; and/or

(c) resistance gene probes derived from genes coding for

5 (i) beta-lactams resistance including gene probes derived from *blaIMP-7*, *mecISepid*, *blaOXA-10*, *blaB*, *ampC*, *blaR*, *blaOXA-32*, *bla-CTX-M-22*, *pbp2aStrpneu*, *blaSHV-1*, *blaOXA-2*, *blaRShaemolyt*, *blaIMP-7*, *mecR*, *blaOXY*, *dacCStrpyog*, *femA*, *mecA*, *blaIShaemolyt*, *blavim*, *pbp2b*, *pbp2primeSepid*, *pbp2x*,
10 *pbp3Saureuc*, *pbp4*, *pbp5Efaecium*, *pbpC*, *mecI*, *pbp1a*, *blaI*, *blaTEM-106*, *blaOXY-KLOX*, *ftsWEF*, *fmhB*, *cumA*, *blaPER-1*, *bla_FOX-3*, *blaA*, *psrb*, *fmhA*, *mecR1Sepid*, *blaZ*, *blaOXA-1*, *fox-6*, *blaPrmi*;

(ii) aminoglycosides resistance including gene probes derived from *aacA_aphDStwar*, *aacC1*, *aacC2*, *strB*, *aadA*, *aadB*, *aadD*, *aacA4*, *strA*, *aph-A3*, *aacC1*, *aacA4*, *aacA-aphD*, *I-spc*, *aphA3*, ; *aacA4ENCL*, *aac(6p)-lb7*;

15 (iii) macrolides-lincosamines-streptogramins resistance including gene probes derived from *ermC*, *linB*, *satSA*, *mdrSA*, *I-linA*, *ermB*, *ermA*, *sata*, *msrA*, *mphBM*, *mefA*, *mrX*;

(iv) trimethoprim resistance including gene probes derived from *dfrA*, *dfrStrpneu*;

(v) chloramphenicol resistance including gene probes derived from *cat*,
20 *catEfaecium*, *cmlA5*;

(vi) tetracyclines resistance including gene probes derived from *tetAJ*, *tetL*, *tetM*;

(vii) glycopeptides resistance including gene probes derived from *vanH(tn)*, *vanA*, *vanHB2*, *vanR*, *vanRB2*, *vanS(tn)*, *vanSB2*, *vanWB2*, *ddl*, *ble*, *vanXB2*, *vanY(tn)*, *vanYB2*, *vanB*, *vanZ(tn)*, *vanC-2*, *vanX(tn)*;

25 (viii) multiple target resistance including gene probes derived from *acrB*, *mexB*, *I-qacA*, *sulI*, *sul*, *cadBStalugd*, *mexA*, *acrR*, *emeA*, *acrA*, *rtn*, *abcXStrpmut*, *qacEdelta1*, *elkT-abcA*, *I-cadA*, *albA*, *wzm*, *msrCb*, *nov*, *wzt*, *wbbl*, *norA23*, *mexR*, *arr2*, *mreA*, *I-cadC*, *uvrA*, , *AdeR-ACIBA*, *adeA-ACIBA*, *adeB-ACIBA*, *adeC-ACIBA*, *AdeS-ACIBA*;

30 (ix) fungicide resistance, especially *C. albicans* fungicide resistance, including gene probes derived from *CRD2*, *CDR1*, *MET3*, *FET3*, *FTR2*, *MDR1-7*, *ERG11*, *SEC20*.

15. The analytical device of any one of claims 1 to 14, wherein

(i) the device comprises the minimal number of species specific gene probes of group (a) as defined in claim 12 or 14 which is sufficient for species identification, preferably the device comprises at least 2 different gene probes per target species
5 of group (a); and/or

(ii) the device comprises the minimal number of virulence gene probes of group (b) as defined in claim 12 or 14 which is sufficient for virulence determination, preferably at least 1 gene probe, more preferably at least 5 different gene probes per target species of group (b); and/or

10 (iii) the device comprises the minimal number of resistance gene probes of group (c) as defined in claim 12 or 14 which is sufficient for determination of resistance, preferably at least 1 gene probe, more preferably at least 5 different gene probes of group (c); and/or

15 (iv) the DNA sequences are selected from the group consisting of SEQ ID NOs 1-918 and 2842-2908, complementary sequences thereto, addition mutants, deletion mutants, substitution mutants and homologues thereof.

16. The analytical device of claim 15, wherein

(i) the gene probes of group (a) are selected from SEQ ID NO:SEQ ID NO:1-99, 142-152, 174-199, 209-214, 216-219, 222-229, 231-291, 308-342, 377-393, 399-
20 431, 449-490, 523-591, 606-639, 645-656, 687-701, 706-749, 776-781, 2843-2863, 2902 and 2903;

(ii) the gene probes of group (b) are selected from SEQ ID NO:100-141, 153-173, 200-208, 215, 220-221, 230, 292-307, 343-376, 394-398, 432-448, 491-522, 592-605, 640-644, 657-686, 702-705, 750-775 and 782-784; and/or

25 (iii) the gene probes of group (c) are selected from SEQ ID NO:785-918, 2864-2875, 2888 and 2907-2908, preferably from SEQ ID NO:785-909, 2864-2875, 2888 and 2907-2908.

17. The analytical device of claim 15 or 16, which

(I) is suitable for identification of *Staphylococcus aureus* and comprises one or
30 more or all of the gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58,

59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902, 2903, preferably comprises at least one of the gene probes represented by SEQ ID NO:71, 68, 4 and 69; and/or

(II) is suitable for identification of *Escherichia coli* and comprises one or more or all of the gene probes selected from SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170, preferably at least one of the gene probe represented by SEQ ID NO:145, 160, 161 and 170; and/or

(III) is suitable for identification of *Staphylococcus epidermidis* and comprises gene probes selected from SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199, preferably at least one of the gene probes represented by SEQ ID NO:177, 178 and 190; and/or

(IV) is suitable for identification of *Staphylococcus haemolyticus* and comprises one or more or all of the gene probes selected from SEQ ID NO:211, 213 and 214, preferably at least one of the gene probes represented by SEQ ID NO:211 and 214; and/or

(V) is suitable for identification of *Staphylococcus lugdunensis* and comprises one or more or all of the gene probes selected from SEQ ID NO:216, 217 and 219-221, preferably at least one of the gene probes represented by SEQ ID NO:216, 219, 220 and 221; and/or

(VI) is suitable for identification of *Staphylococcus warneri* and comprises one or more or all of the gene probes selected from SEQ ID NO:224-228 and 230, preferably at least one of the gene probes represented by SEQ ID NO:224, 226, and 230; and/or

(VII) is suitable for identification of *Staphylococcus saprophyticus* and comprises one or more or all of the gene probes selected from SEQ ID NO:222 and 223; and/or

(VIII) is suitable for identification of *Staphylococcus hominis* and comprises one or more or all of the gene probes selected from SEQ ID NO:2096, 194, 229, 211 and 214; and/or

(IX) is suitable for identification of *Candida albicans* and comprises one or more or all of the gene probes selected from SEQ ID NO:231-291, preferably at least one of the gene probes represented by SEQ ID NO:232 and 249; and/or

(X) is suitable for identification of *Enterococcus faecalis* and comprises one or more or all of the gene probes selected from SEQ ID NO:308-310 and 312-342, preferably at least one of the gene probes represented by SEQ ID NO:308, 310 and 314; and/or

5 (XI) is suitable for identification of *Enterococcus faecium* and comprises one or more or all of the gene probes selected from SEQ ID NO:377-393, preferably at least one of the gene probes represented by SEQ ID NO:380 and 385; and/or

(XII) is suitable for identification of *Klebsiella pneumoniae* and comprises one or more or all of the gene probes selected from SEQ ID NO:399, 401-404, 408-415,
10 417, 420-423, 425 and 427-431, preferably at least one of the gene probes represented by SEQ ID NO:401, 410 and 430; and/or

(XIII) is suitable for identification of *Klebsiella oxytoca* and comprises one or more or all of the gene probes selected from SEQ ID NO:459 and 466-469, preferably at least one of the gene probes represented by SEQ ID NO:459, 468 and 469; and/or

15 (XIV) is suitable for identification of *Pseudomonas aeruginosa* and comprises one or more or all of the gene probes selected from SEQ ID NO:470-485, 487-493 and 505, preferably at least one of the gene probes represented by SEQ ID NO:471, 474, 488 and 505; and/or

(XV) is suitable for identification of *Streptococcus pneumoniae* and comprises one
20 or more or all of the gene probes selected from SEQ ID NO:523-591, preferably at least one of the gene probes represented by SEQ ID NO:558 and 562; and/or

(XVI) is suitable for identification of *Streptococcus agalactiae* and comprises one or more or all of the gene probes selected from SEQ ID NO:606-639, preferably at least one of the gene probes represented by SEQ ID NO:606 and 619; and/or

25 (XVII) is suitable for identification of *Streptococcus pyogenes* and comprises one or more or all of the gene probes selected from SEQ ID NO:645-648, 652, 655-656, 658 and 660, preferably at least one of the gene probes represented by SEQ ID NO:645, 658 and 660; and/or

(XVIII) is suitable for identification of *Streptococcus mutans* and comprises one or
30 more or all of the gene probes selected from SEQ ID NO:687-701, preferably at least one of the gene probes represented by SEQ ID NO:687, 691 and 692; and/or

(XIX) is suitable for identification of *Proteus mirabilis* and comprises one or more or all of the gene probes selected from SEQ ID NO:706-710, 712-742 and 744-749, preferably at least one of the gene probes represented by SEQ ID NO:721, 725 and 735; and/or

- 5 (XX) is suitable for identification of *Proteus vulgaris* and comprises one or more or all of the gene probes selected from SEQ ID NO:776-778 and 780-781, preferably at least one of the gene probes represented by SEQ ID NO:776, 777 and 781; and/or

- 10 (XXI) is suitable for identification of *Acinetobacter baumannii* and comprises one or more or all of the gene probes selected from SEQ ID NO:2843-2863, preferably at least one of the gene probes represented by SEQ ID NO:2858 and 2863.

18. The analytical device of claim 17, which further comprises

- (I) for the characterisation of *Staphylococcus aureus*: one or more or all of the gene probes of group (b) selected from SEQ ID NO:100-141, and/or
15 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

- (II) for the characterisation of *Escherichia coli*: one or more or all of the gene probes of group (b) selected from SEQ ID NO:153-173, and/or
of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875,
20 2888, 2907-2908; and/or

- (III) for the characterisation of *Staphylococcus epidermidis*: one or more or all of the gene probes of group (b) selected from SEQ ID NO:200-208, and/or
of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875,
2888, 2907-2908; and/or

- 25 (IV) for the characterisation of *Staphylococcus haemolyticus*: one or more or all of the gene probe of group (b) represented by SEQ ID NO:215, and/or
of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(V) for the characterisation of *Staphylococcus lugdunensis*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:220-221, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VI) for the characterisation of *Staphylococcus warneri*: one or more or all

5 of the gene probe of group (b) represented by SEQ ID NO:230, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VII) for the characterisation of *Staphylococcus saprophyticus*: one or more or all

10 of the gene probe of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VIII) for the characterisation of *Staphylococcus hominis*: one or more or all

of the gene probe of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(IX) for the characterisation of *Candida albicans*: one or more or all

15 of the gene probes of group (b) selected from SEQ ID NO:292-307, and/or

of the gene probes of group (c) selected from SEQ ID NO:910-918; and/or

(X) for the characterisation of *Enterococcus faecalis*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:343-376, and/or

20 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XI) for the characterisation of *Enterococcus faecium*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:394-398, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

25 (XII) for the characterisation of *Klebsiella pneumonia*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:432-448, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIII) for the characterisation of *Klebsiella oxytoca*: one or more or all of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIV) for the characterisation of *Pseudomonas aeruginosa*: one or more or all

5 of the gene probes of group (b) selected from SEQ ID NO:491-522, and/or of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XV) for the characterisation of *Streptococcus pneumoniae*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:592-605, and/or

10 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XVI) for the characterisation of *Streptococcus agalactiae*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:640-644, and/or

15 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XVII) for the characterisation of *Streptococcus pyogenes*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:657-686, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

20 (XVIII) for the characterisation of *Streptococcus viridans*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:702-705, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIX) for the characterisation of *Proteus mirabilis*: one or more or all

25 of the gene probes of group (b) selected from SEQ ID NO:750-775, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XX) for the characterisation of *Proteus vulgaris*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:782-784, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908.

(XXI) for the characterisation of *Acinetobacter baumannii*: one or more or all

5 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908.

10 19. Use of the analytical device of any one of claims 1-18 for *in vitro* identification and characterisation of microorganisms in a sample or in a clinical specimen, preferably for the diagnosis of a clinical condition, more preferably for the diagnosis of bacteremia, fungemia or sepsis.

20. Use of the analytical device of any one of claims 1-18 for *in vitro* differentiation of a plurality of different microbial strains contained in one sample and/or for species-specific identification of one or more microbial strain contained in a mixture of a plurality of microorganisms.

15 21. An *in vitro* method for identification and characterisation of microorganisms in a sample or in a clinical specimen comprising

(a) isolating the total DNA from the sample or clinical specimen and labelling the DNA with a reporter molecule;

20 (b) applying the DNA thus obtained to the analytical device of anyone of claims 1-18 and hybridising the DNA with the gene probes of the analytical device; and

(c) detecting DNA bound to the analytical device by determination of the amount of the reporter molecules bound to the device.

22. The method of claim 21,

(i) which is a method for diagnosis of bacteremia, fungemia or sepsis; and/or

25 (ii) wherein the clinical specimen is a positive blood culture; and/or

(iii) wherein the ratio of microbial DNA to total DNA isolated from said sample or clinical specimen is less than 100 %, preferably from 1% to 99%; and/or

(iv) wherein the reporter molecule is a fluorochrome; and/or

30 (v) wherein the determination of the amount of reporter molecules bound to the device is achieved by visualization of the reporter molecule; and/or

(vi) wherein the DNA isolated in step (a) is labelled and applied to the analytical device without prior amplification, preferably is labelled by random priming; and/or
(vii) wherein the DNA isolated in step (a) is fragmented before the labelling reaction.

5 23. The method of claim 21 or 22, wherein the analytical device is a DNA microarray and the detection is preferably performed using a DNA microarray reader.

10 24. The method of claim 21 or 22, wherein the analytical device is a DNA coated bead or a set of DNA coated beads, and the application and/or detection step is preferably performed in a microfluidic device.

25. A kit for detection of microorganisms in a sample or clinical specimen comprising the analytical device of any one of claims 1 to 18.



Fig. 1A

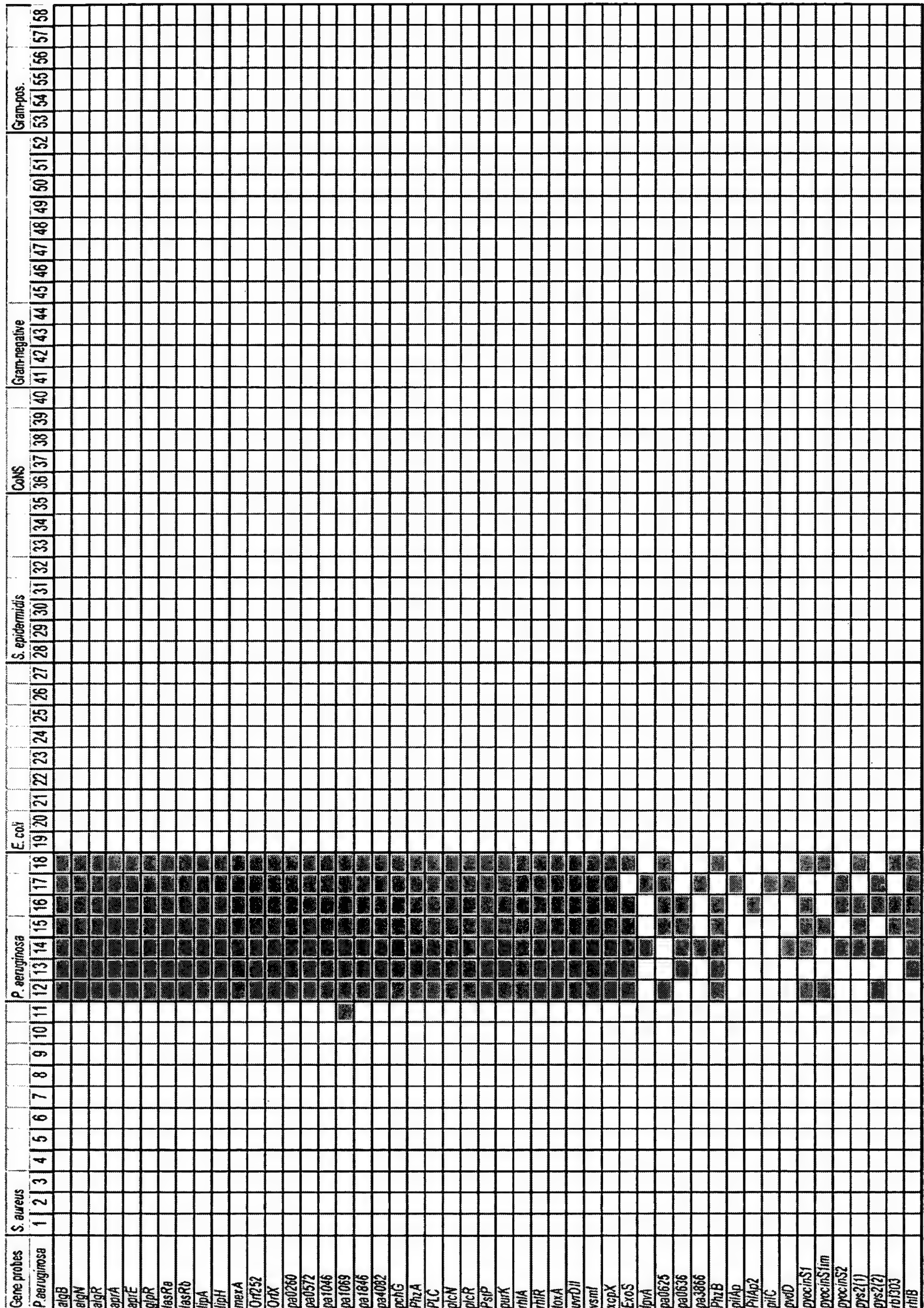


Fig. 1B

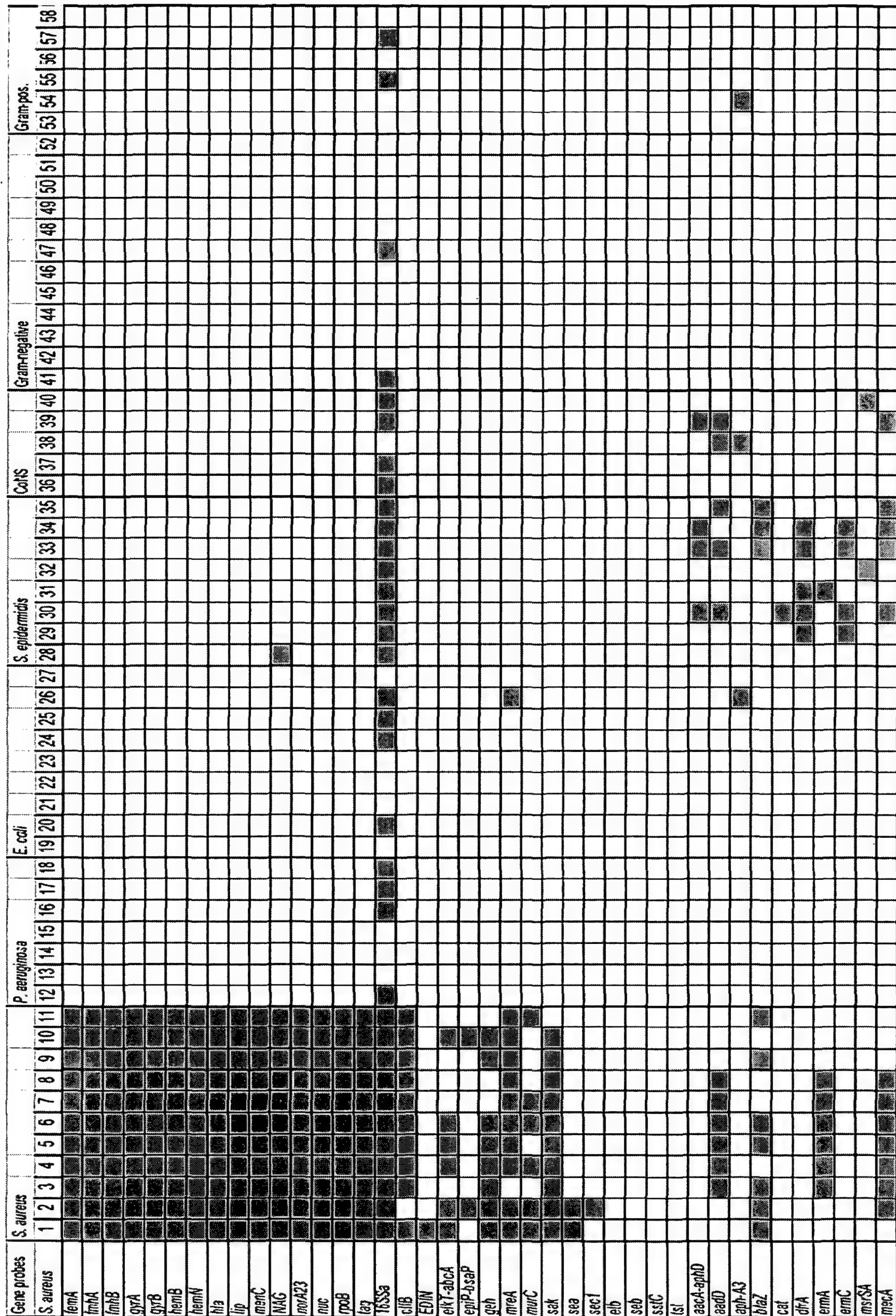


Fig. 1C

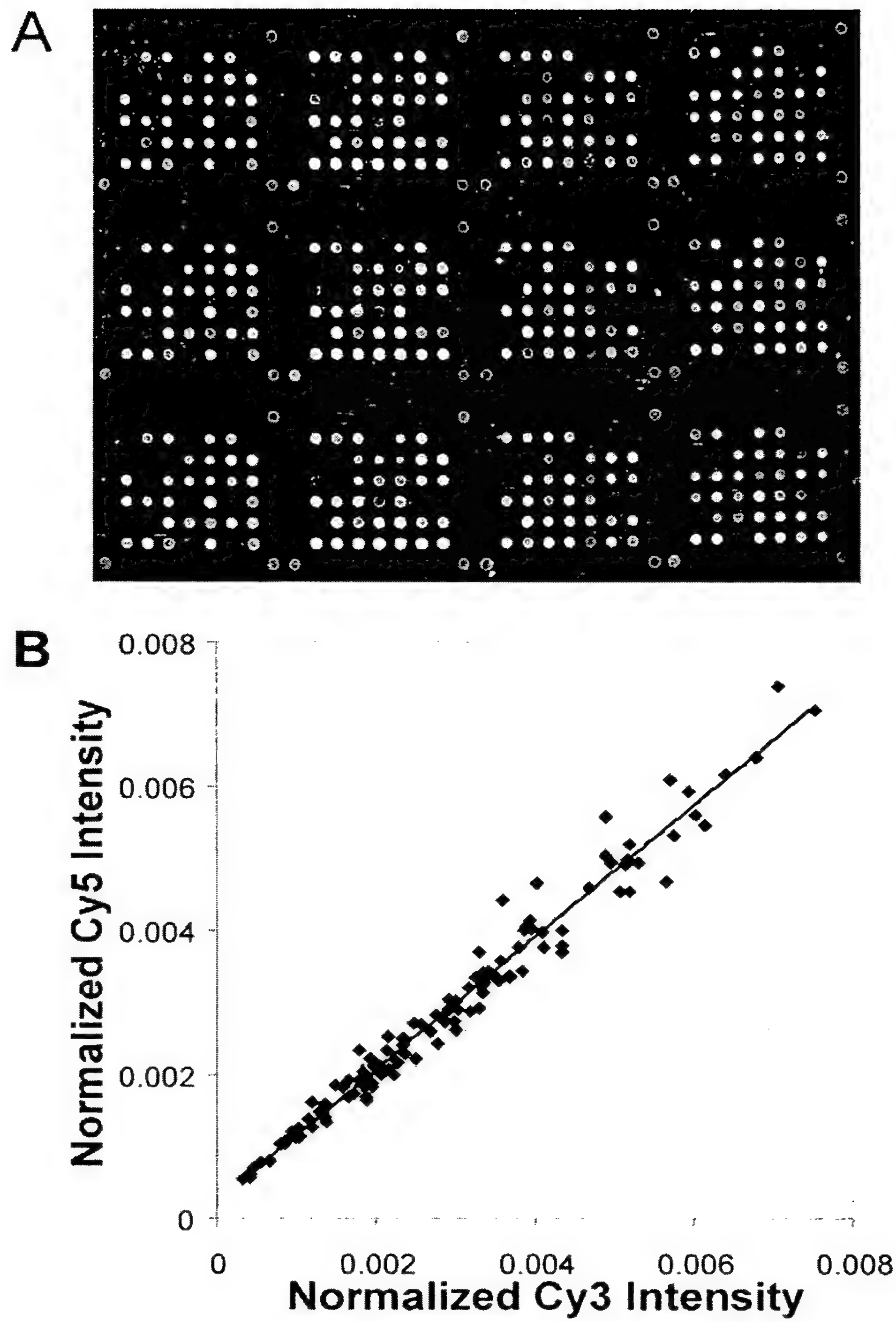


Fig.2

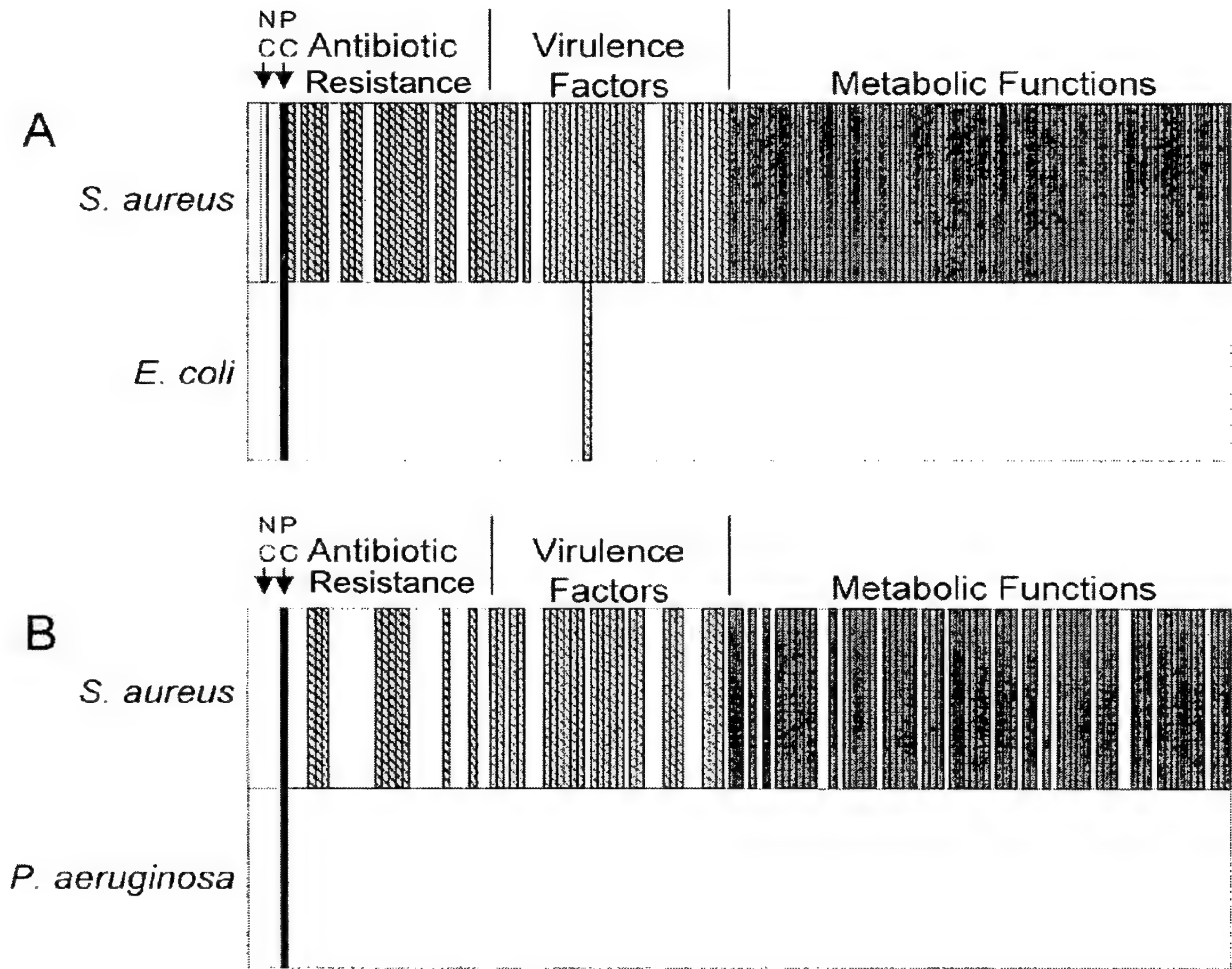


Fig.3

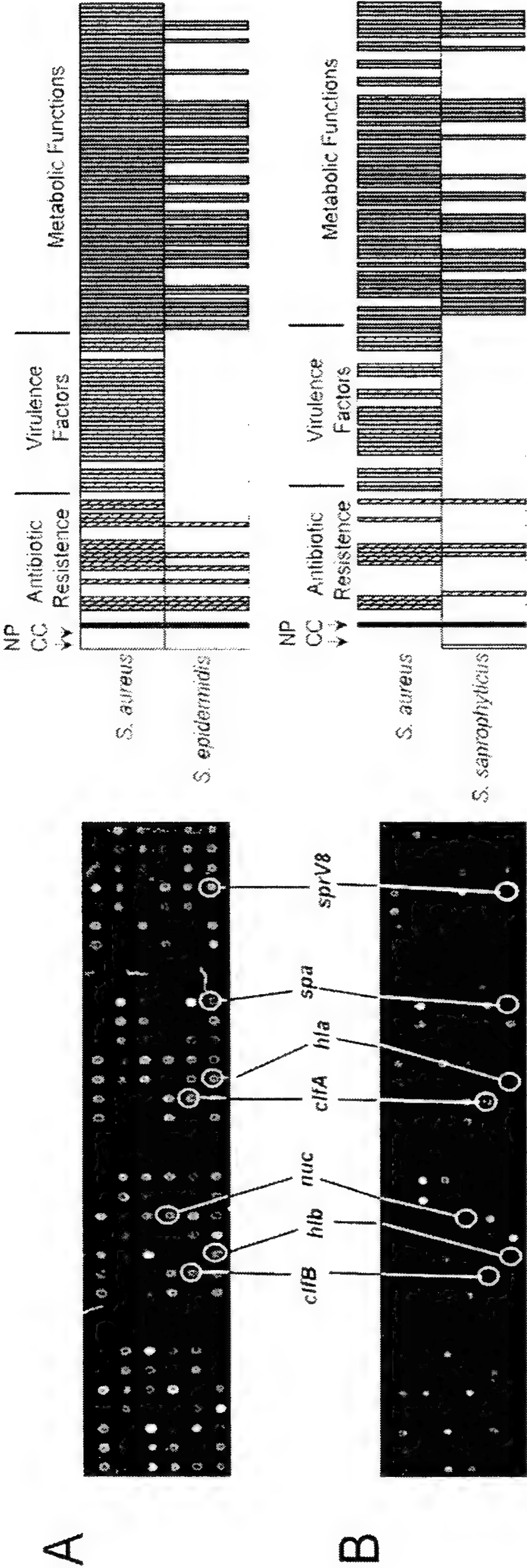


Fig.4

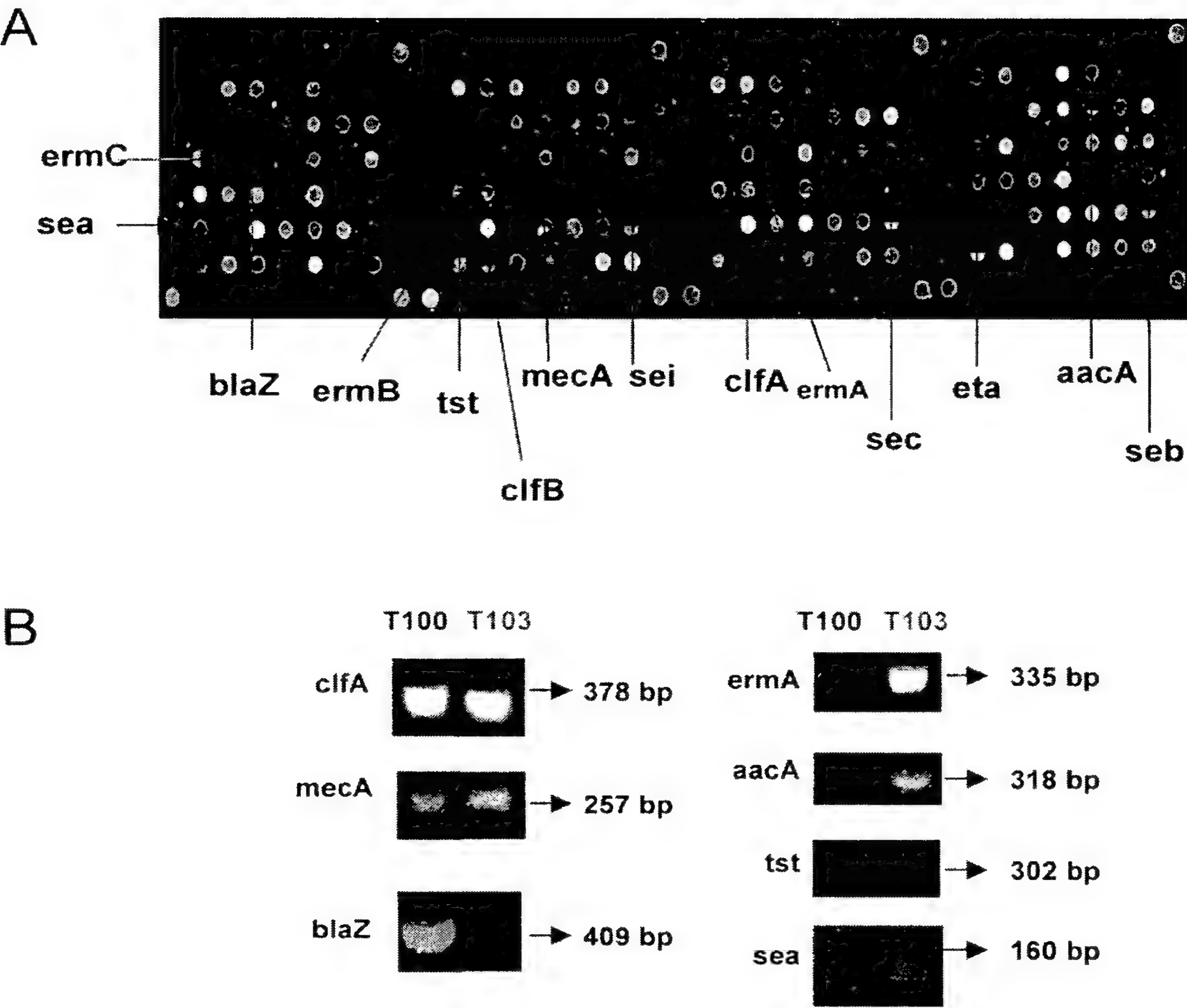


Fig.5

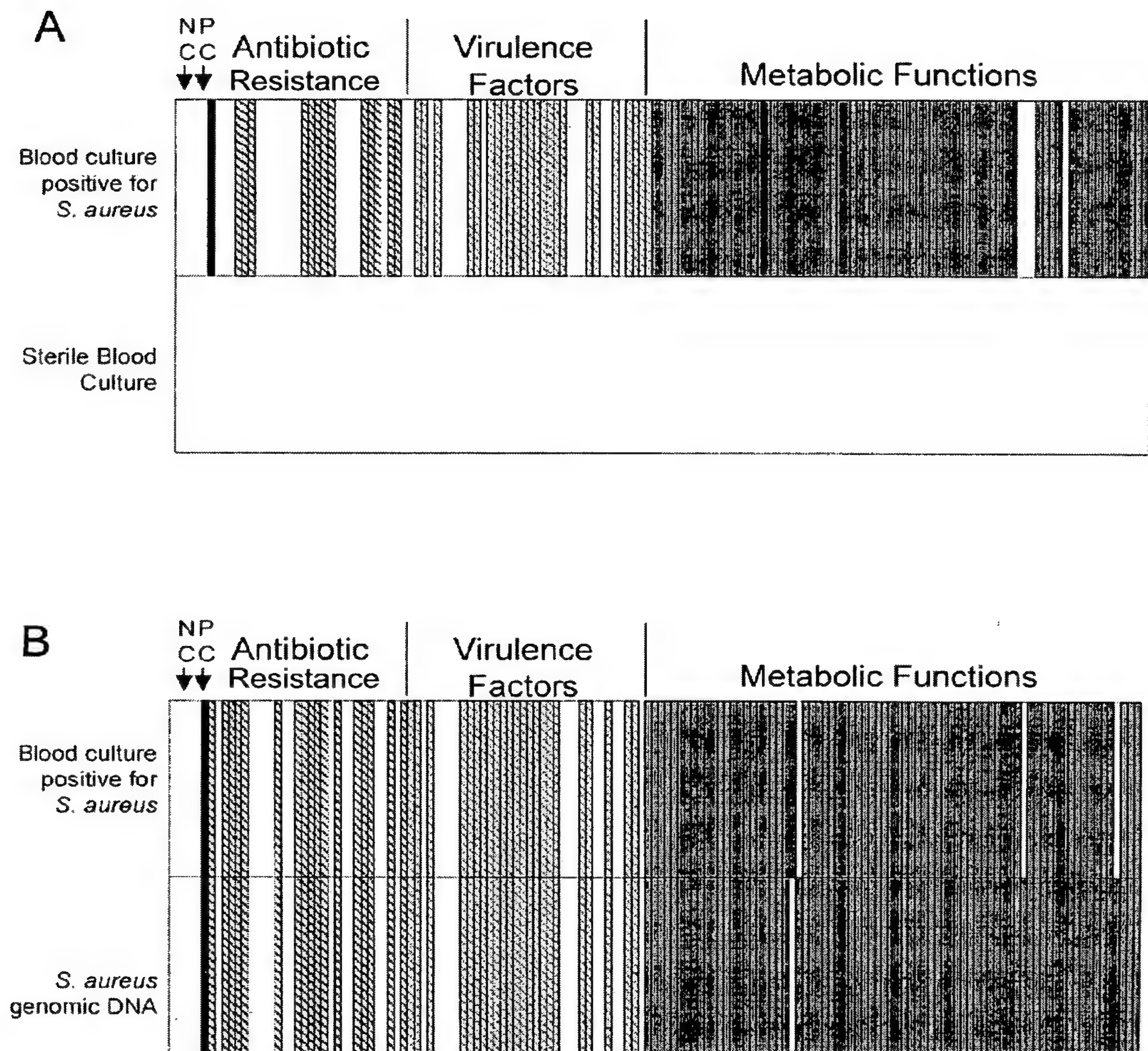


Fig.6

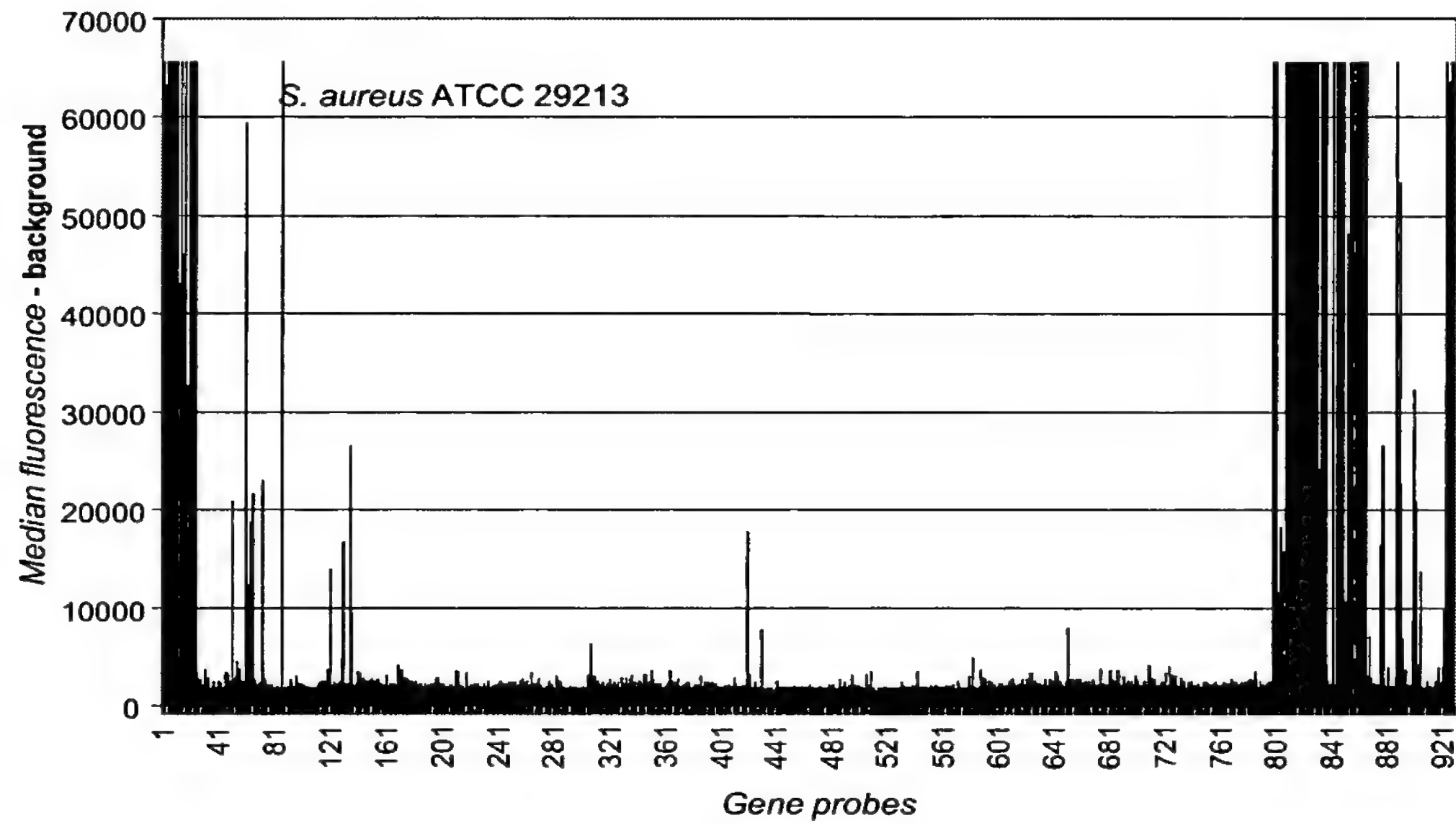


Fig.7A

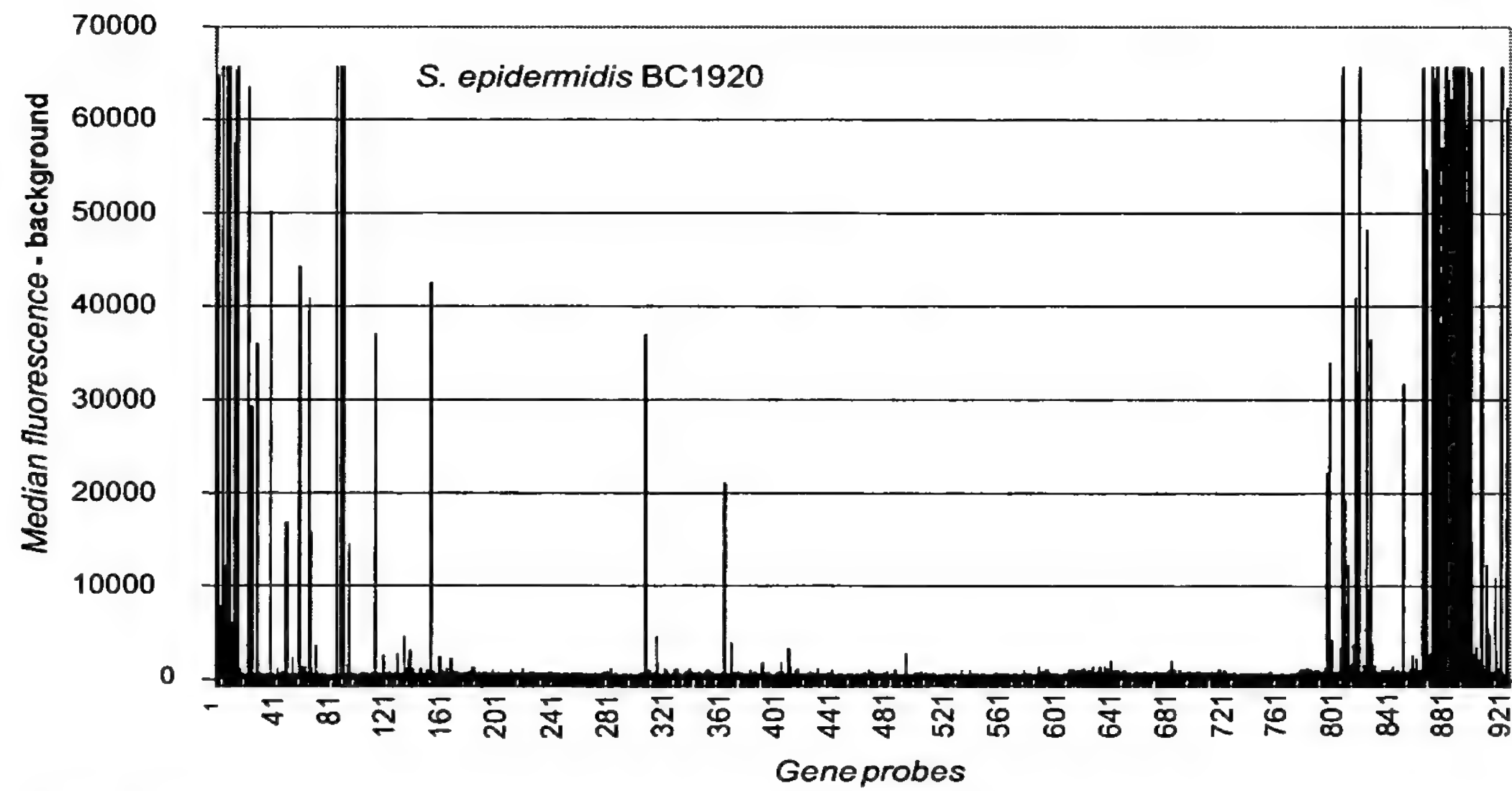


Fig.7B

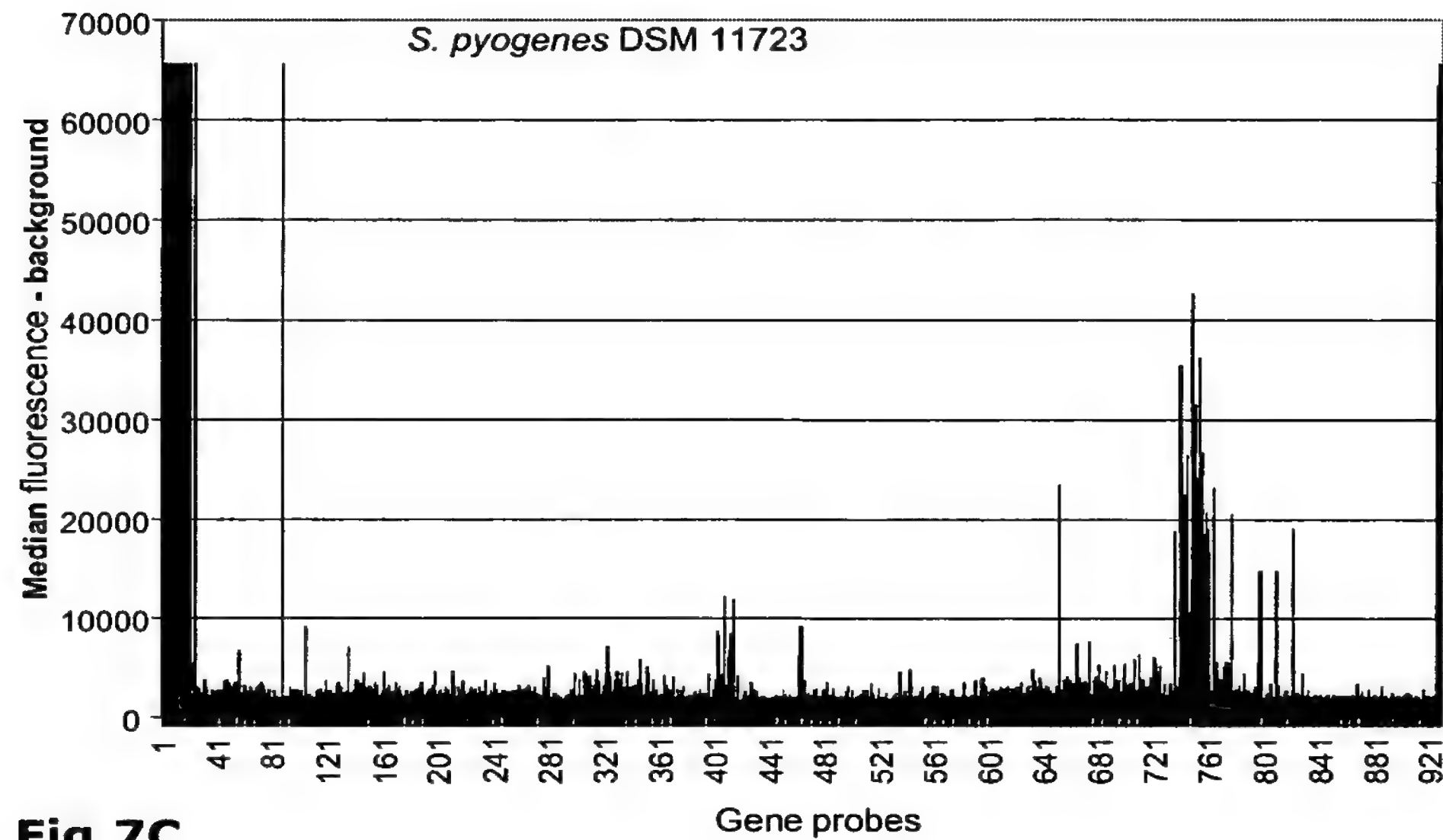


Fig.7C

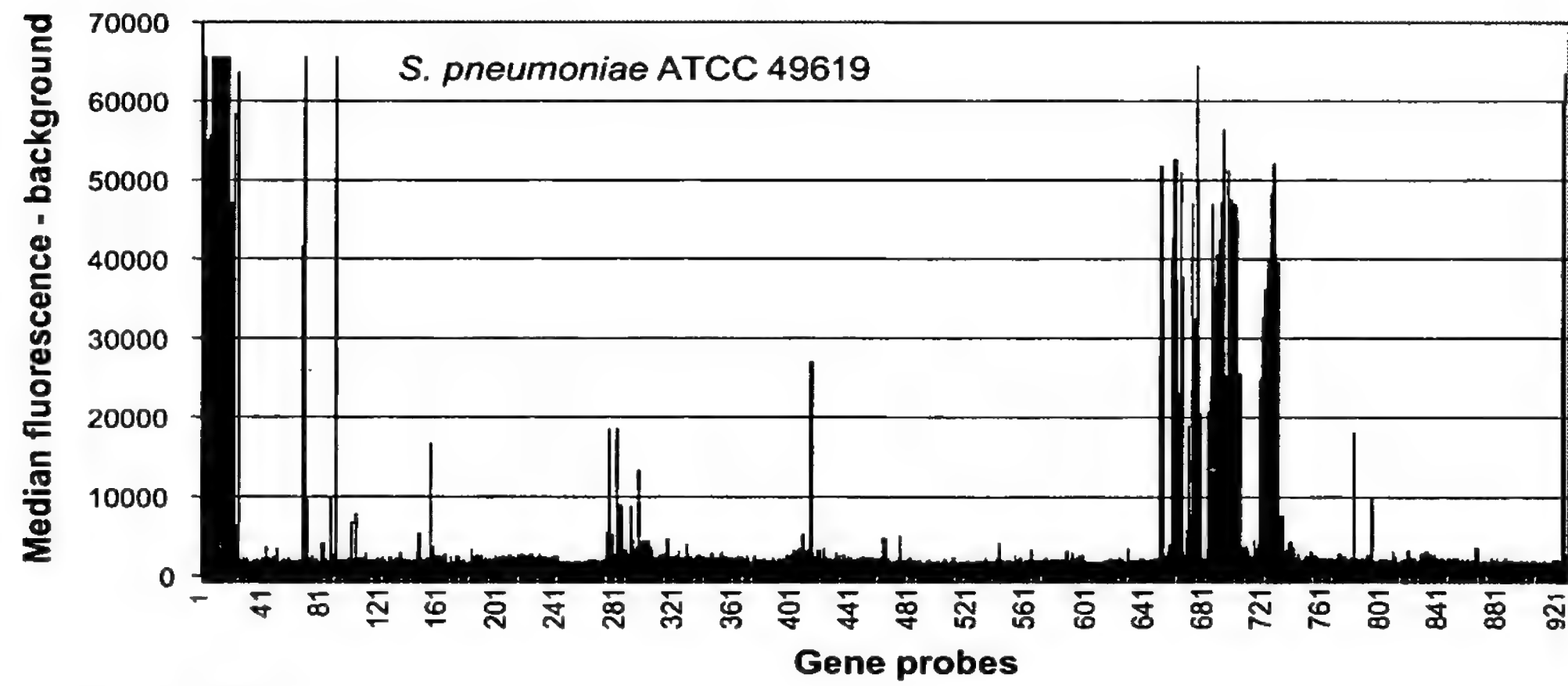


Fig.7D

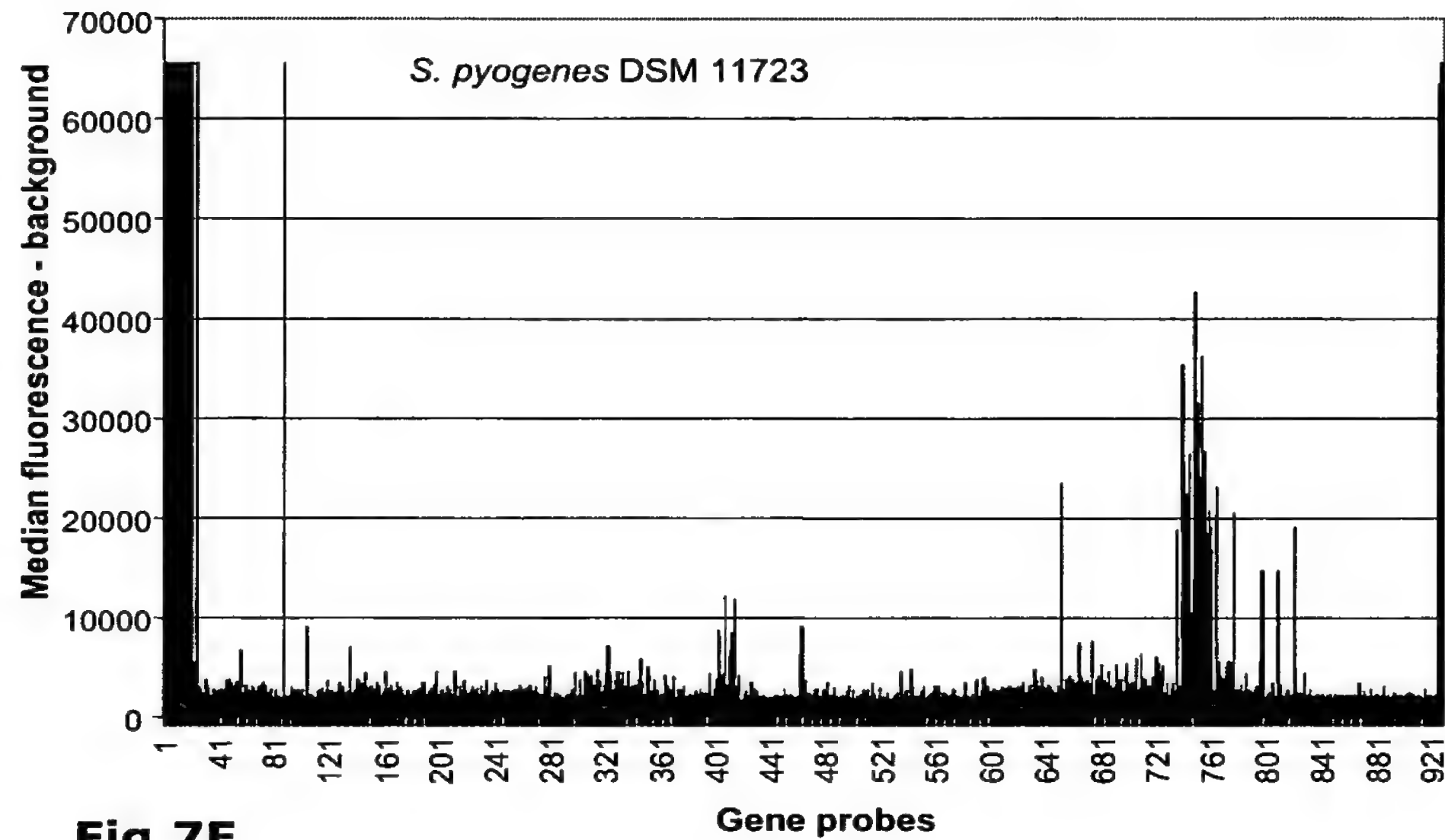


Fig.7E

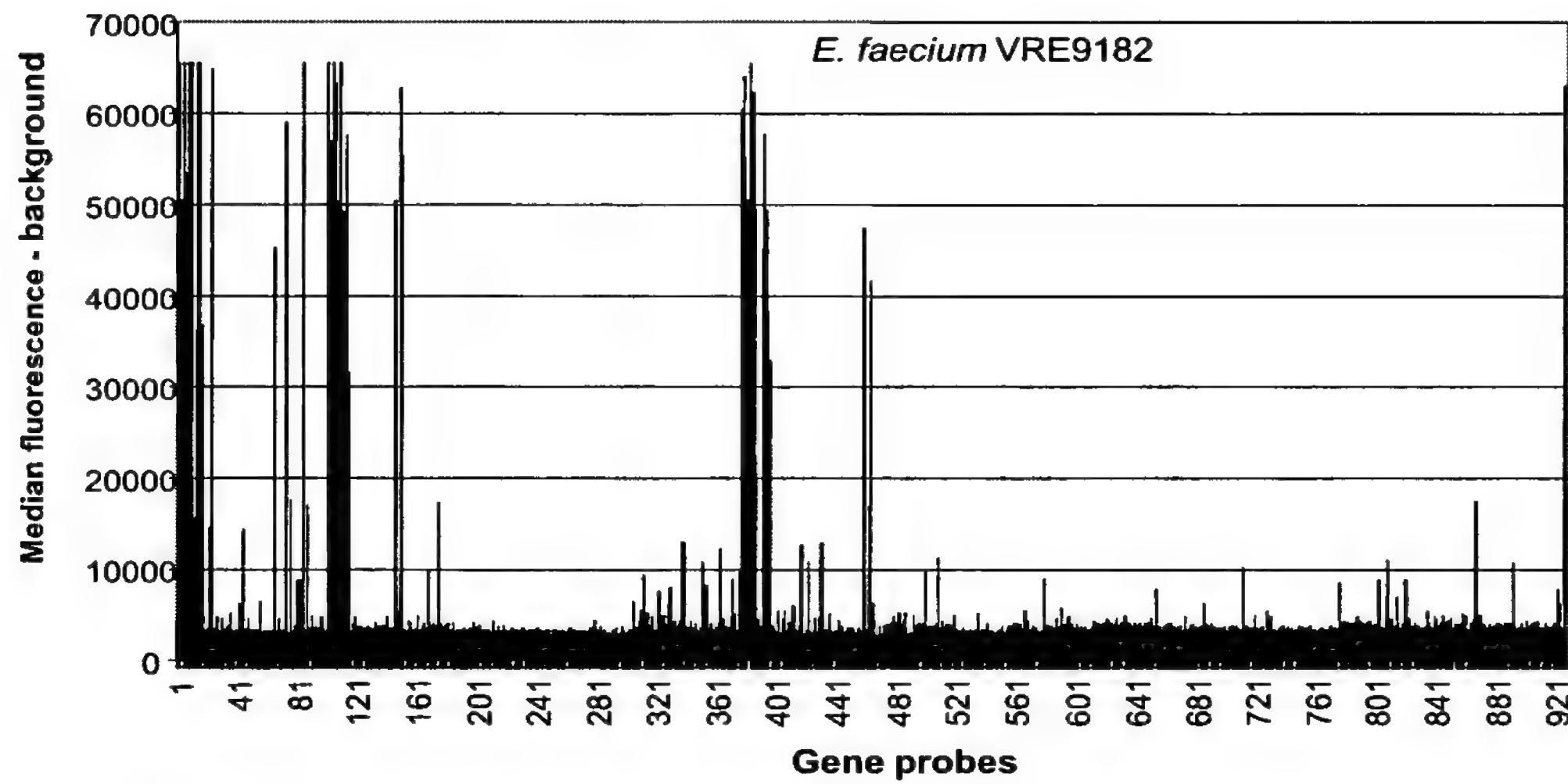


Fig.7F

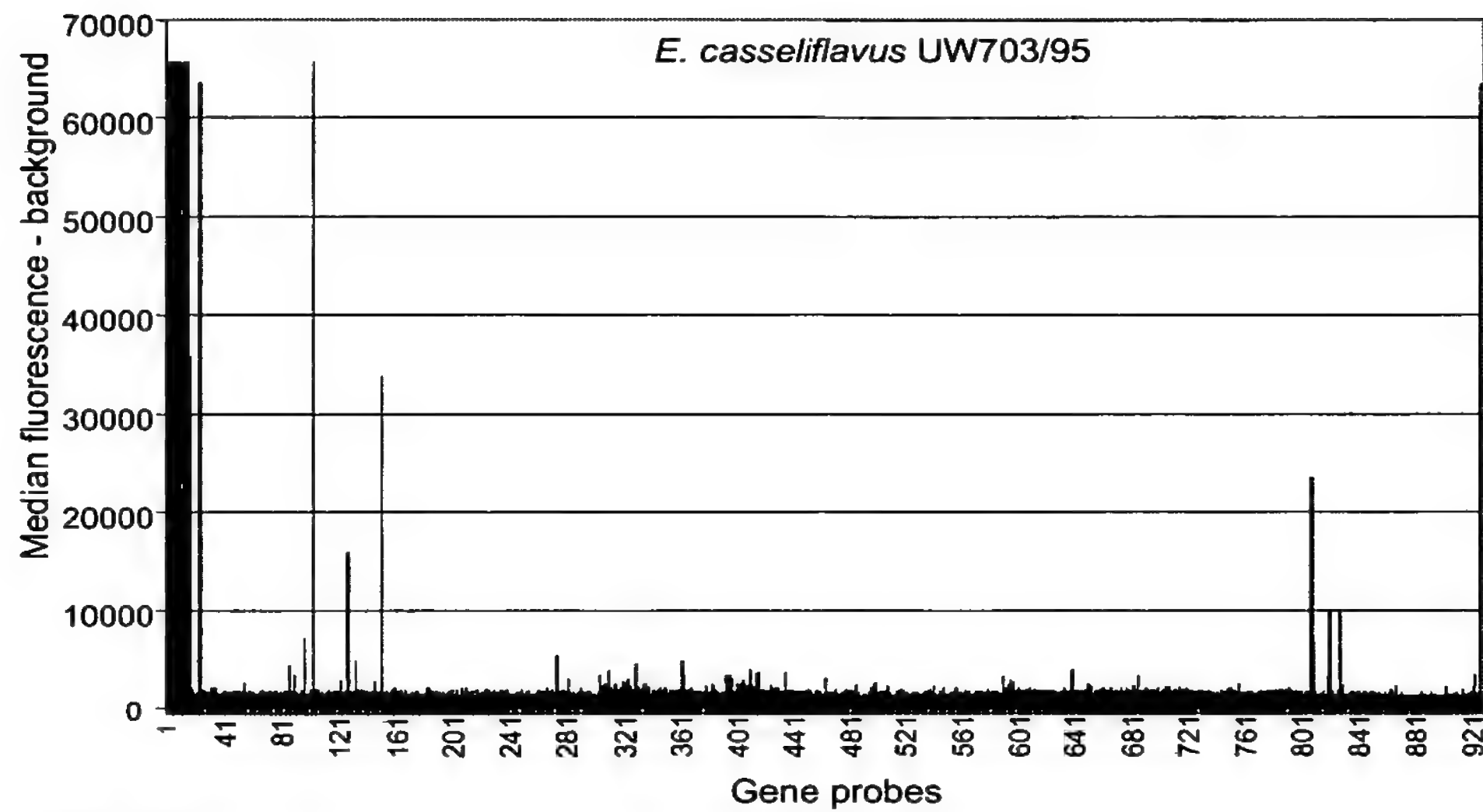


Fig.7G

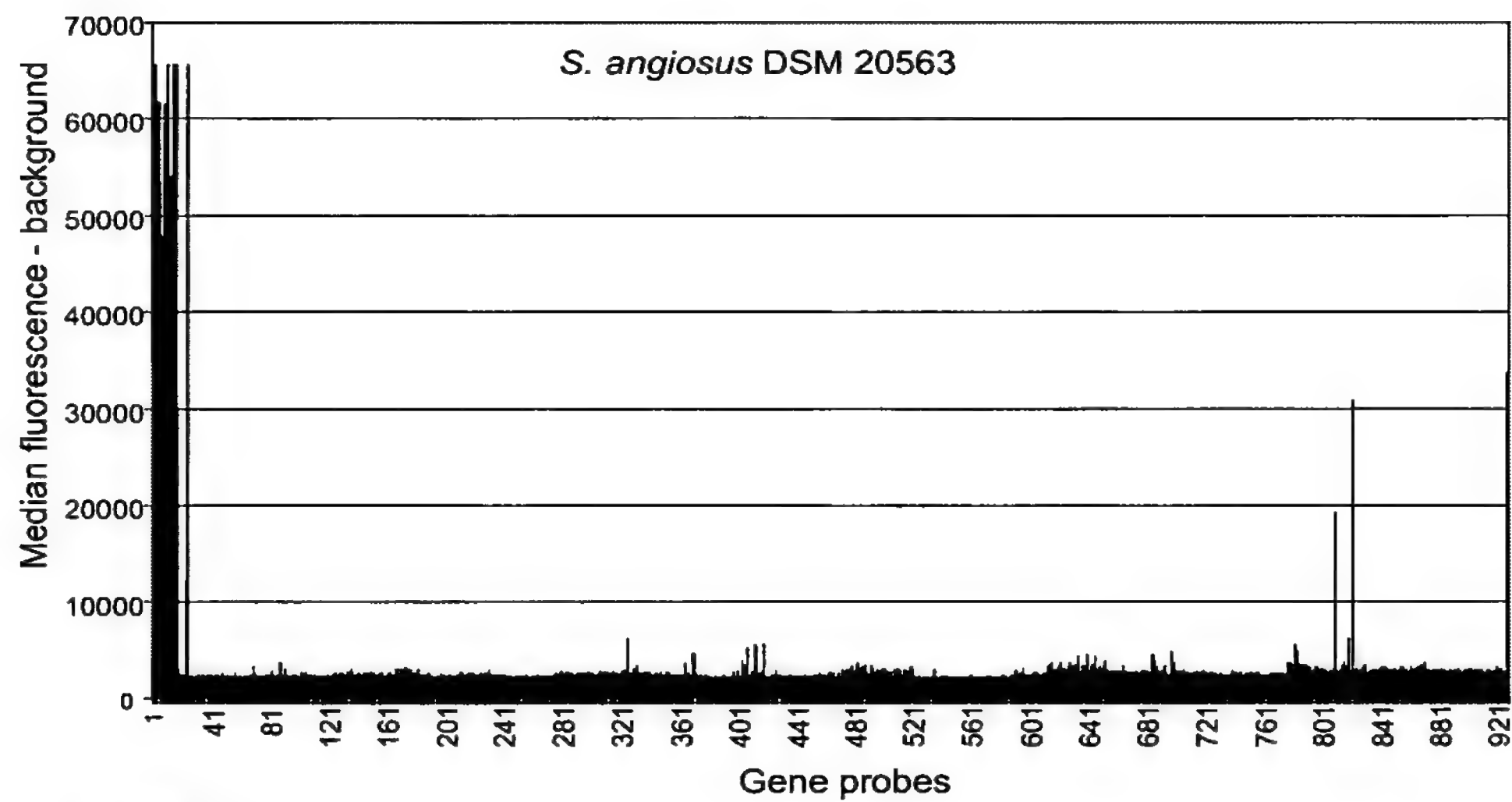


Fig.7H

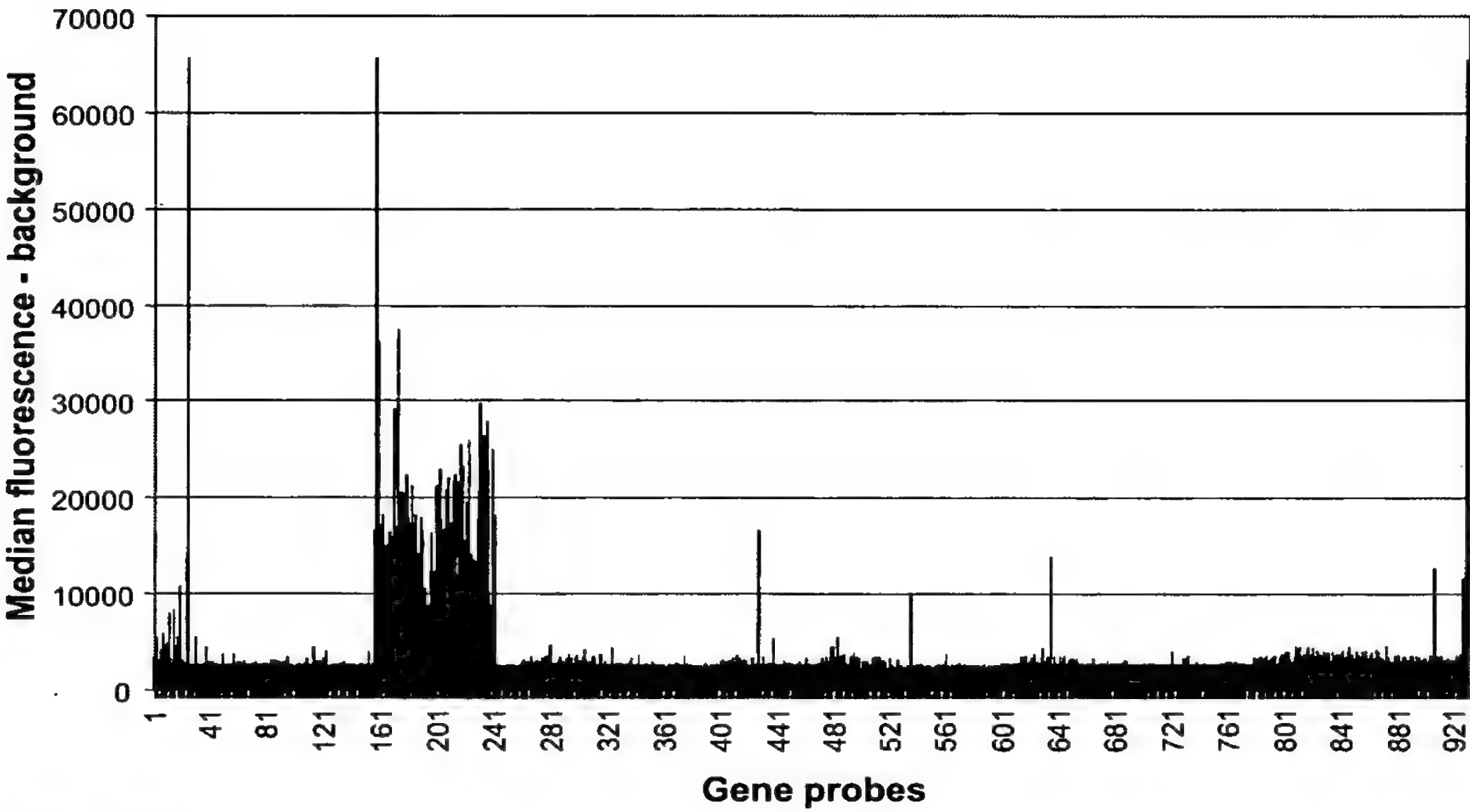


Fig.8A

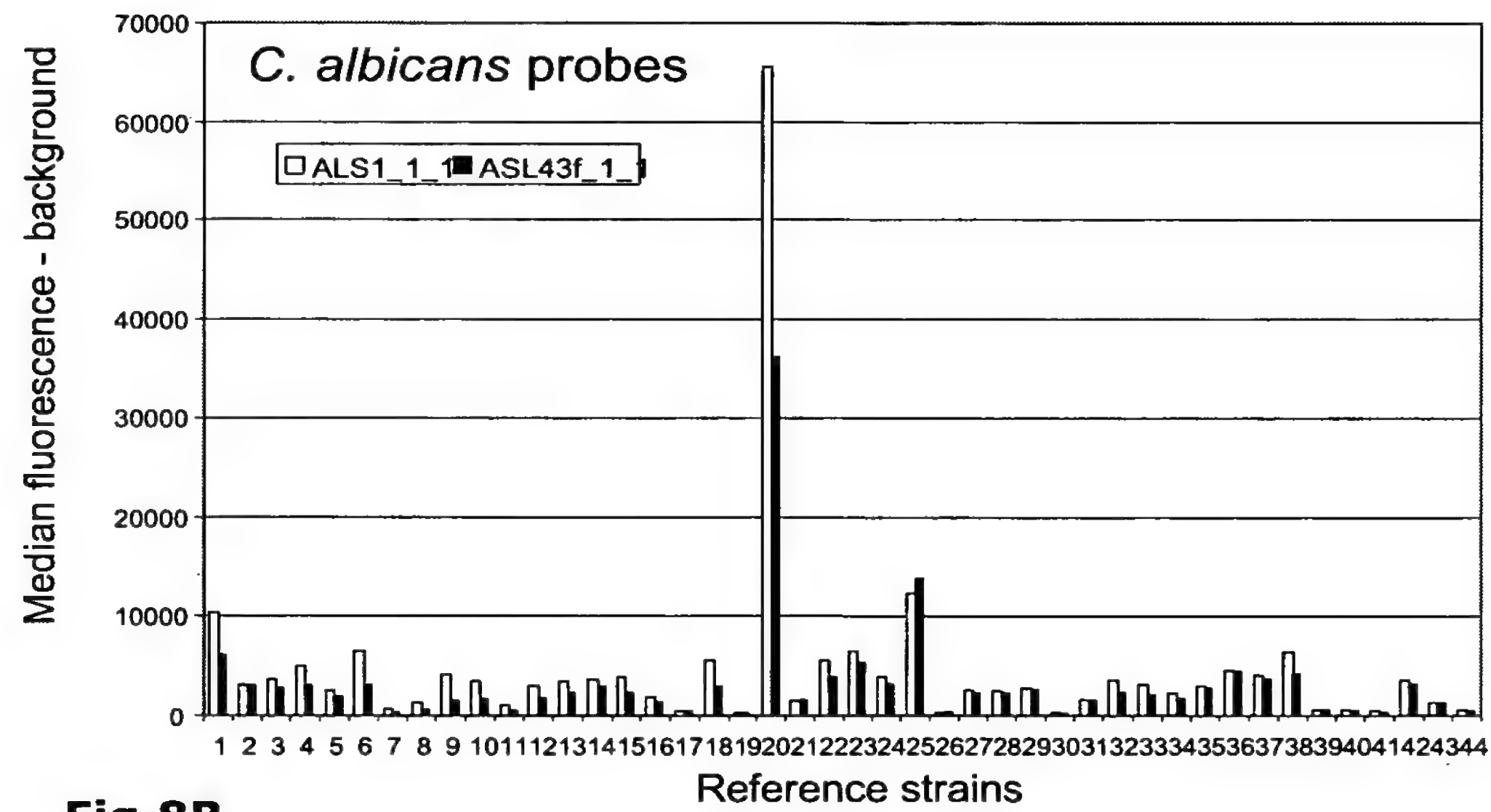


Fig.8B

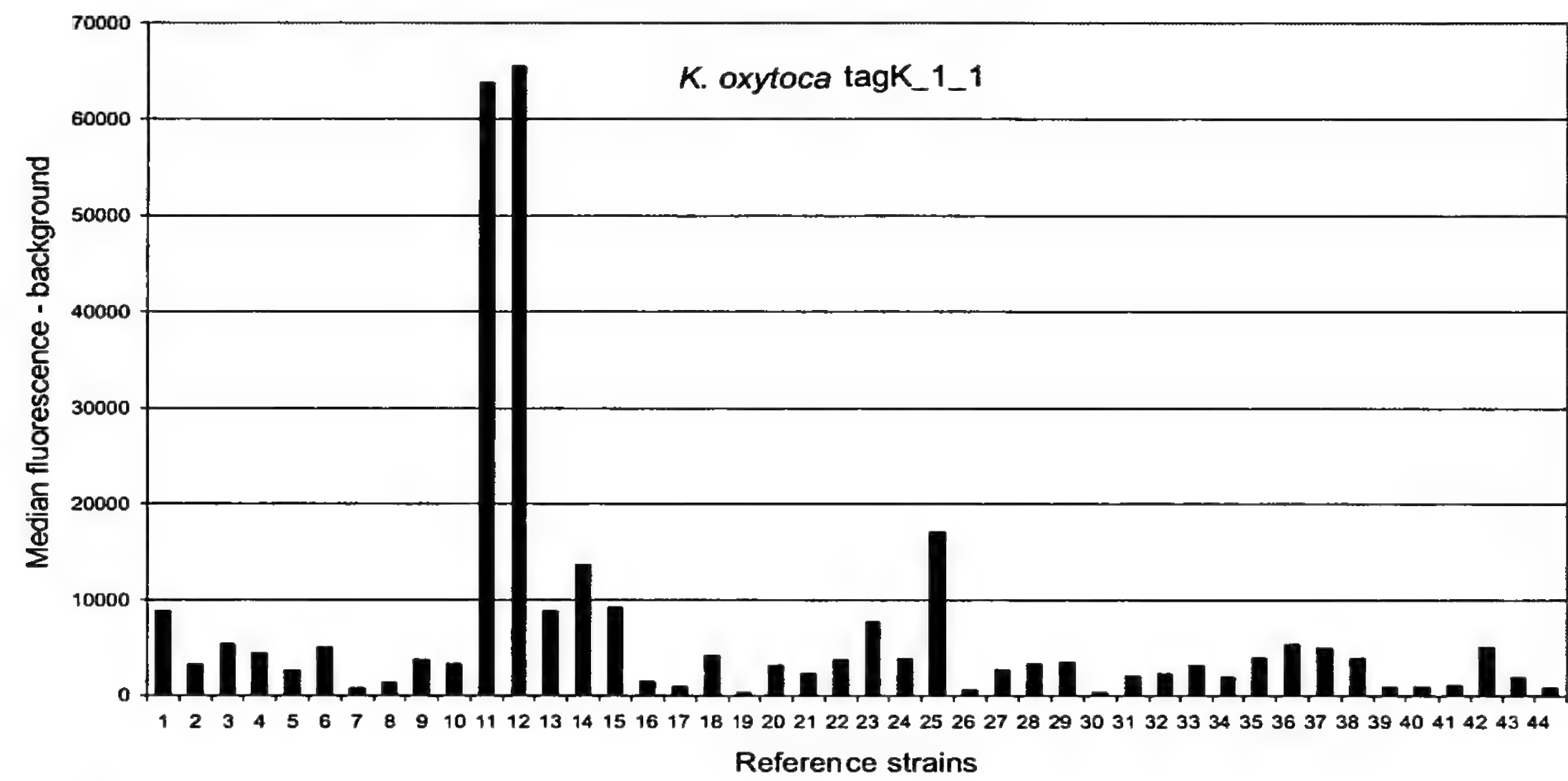


Fig.9A

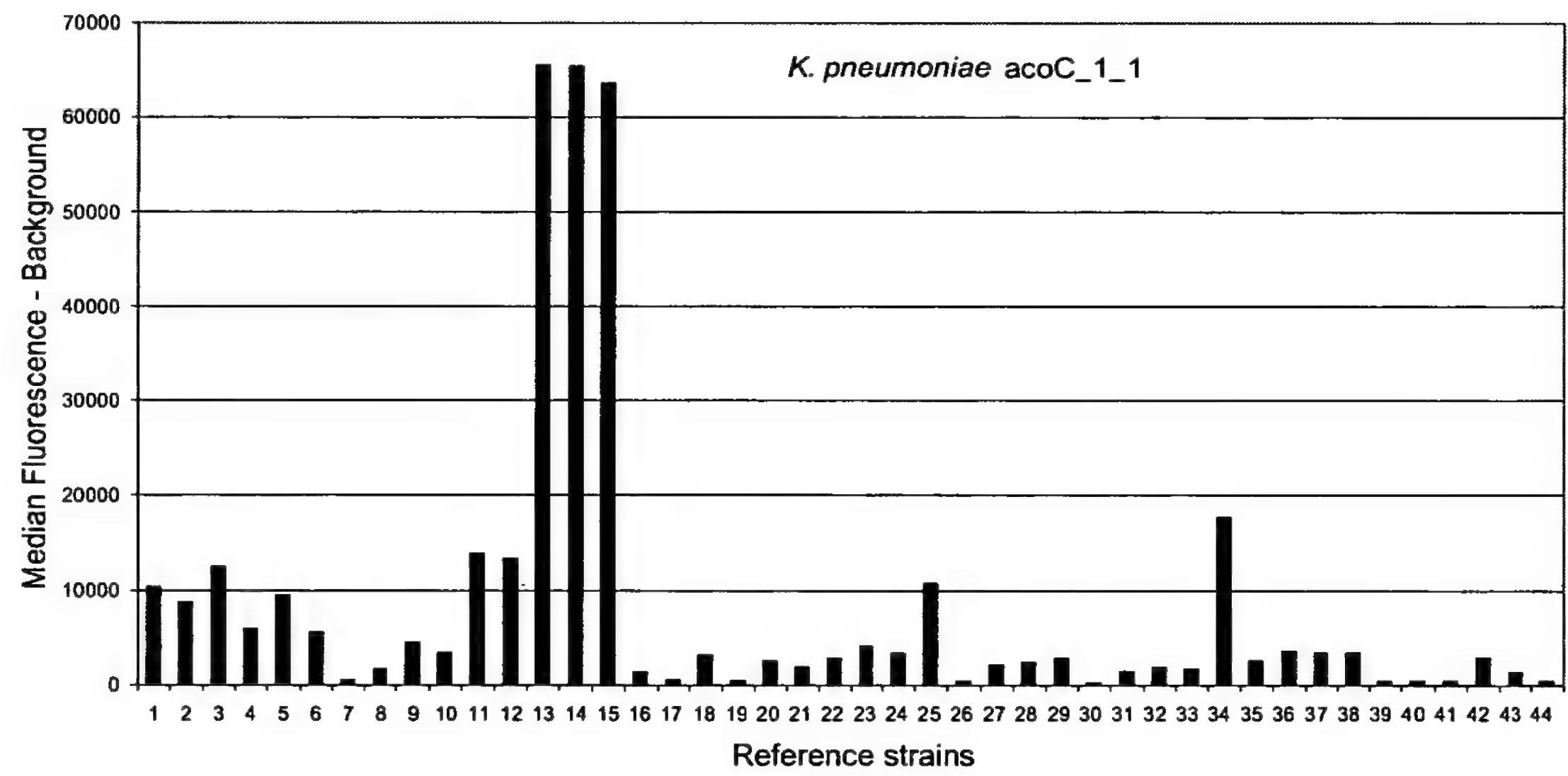


Fig.9B

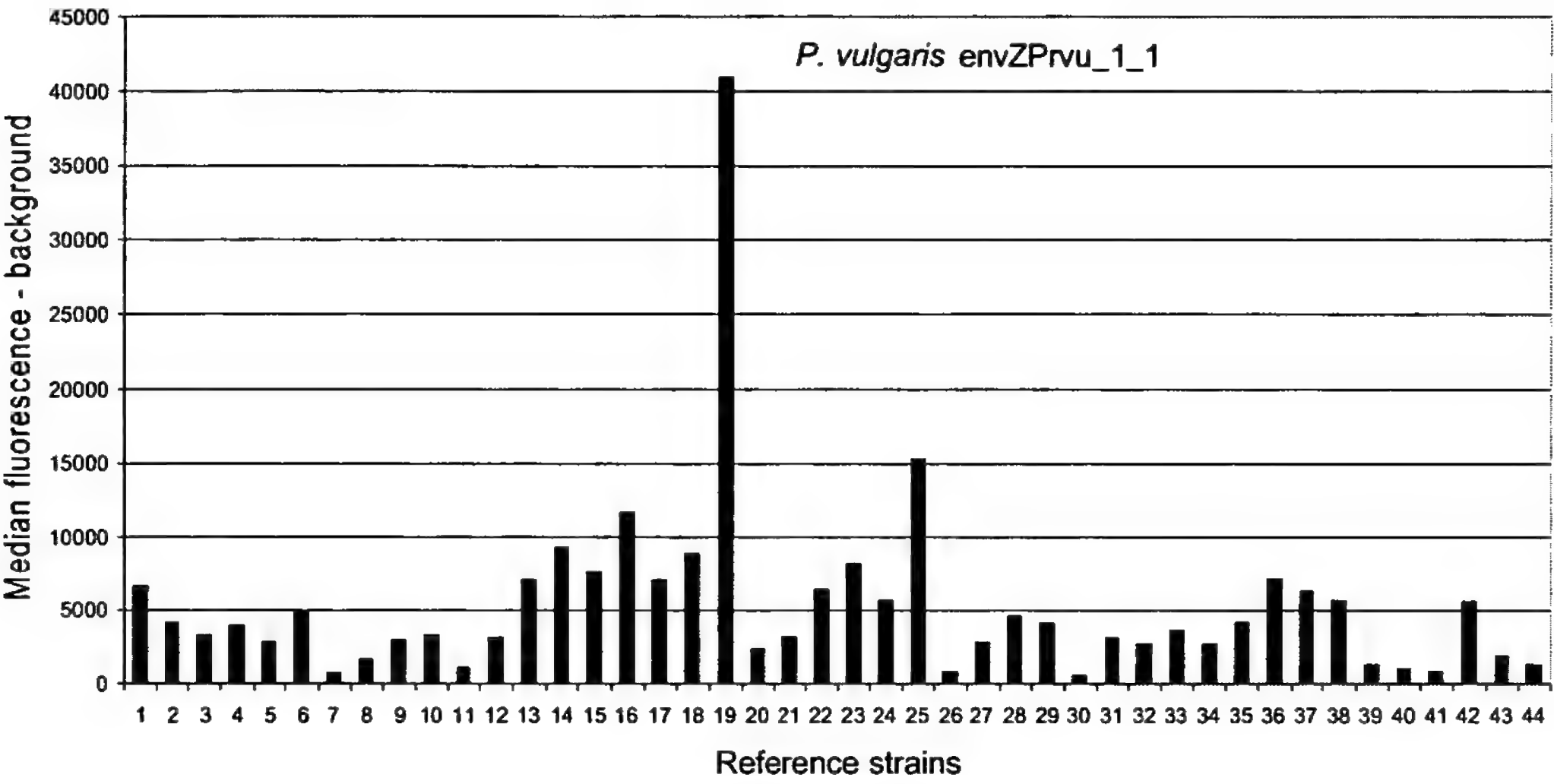


Fig.9C

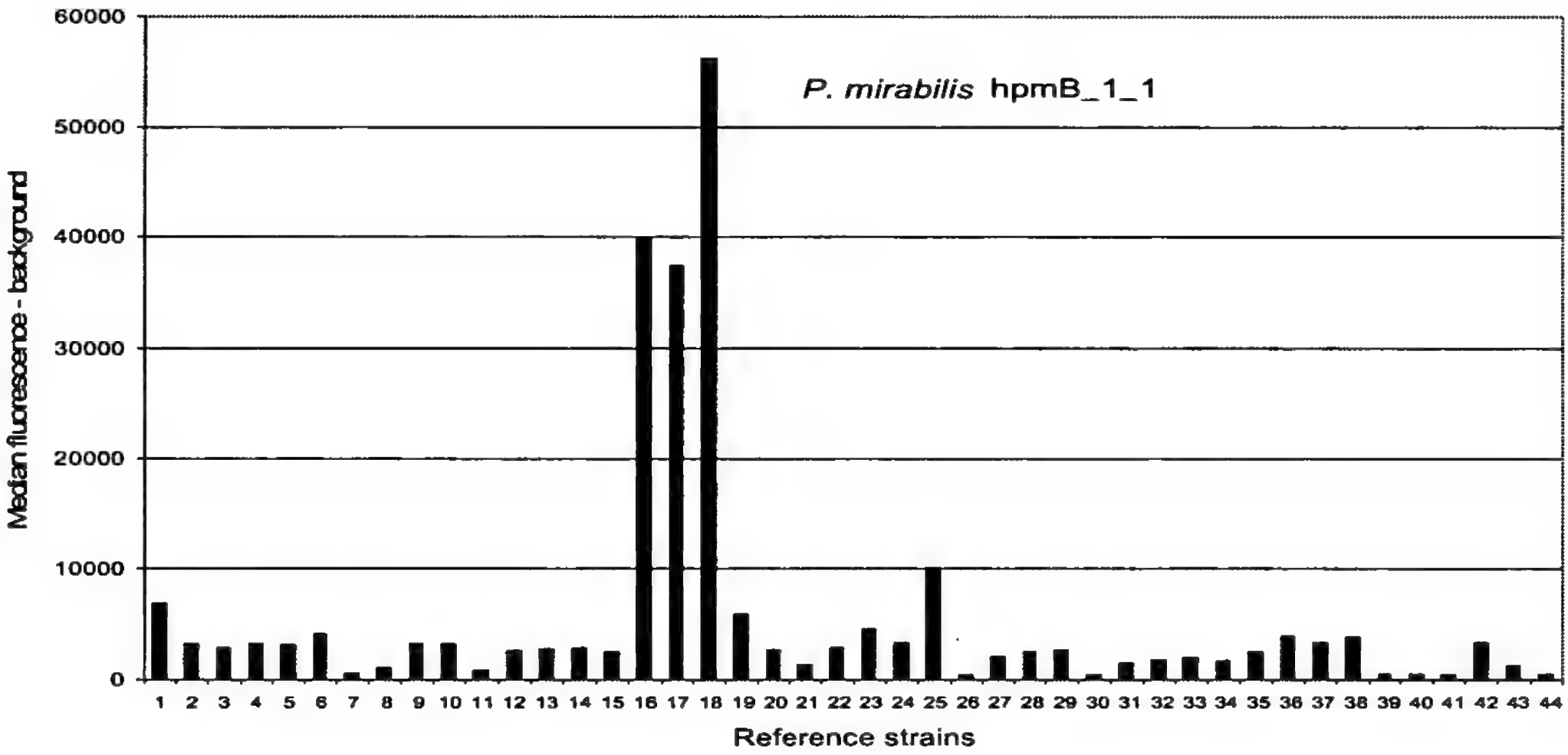


Fig.9D

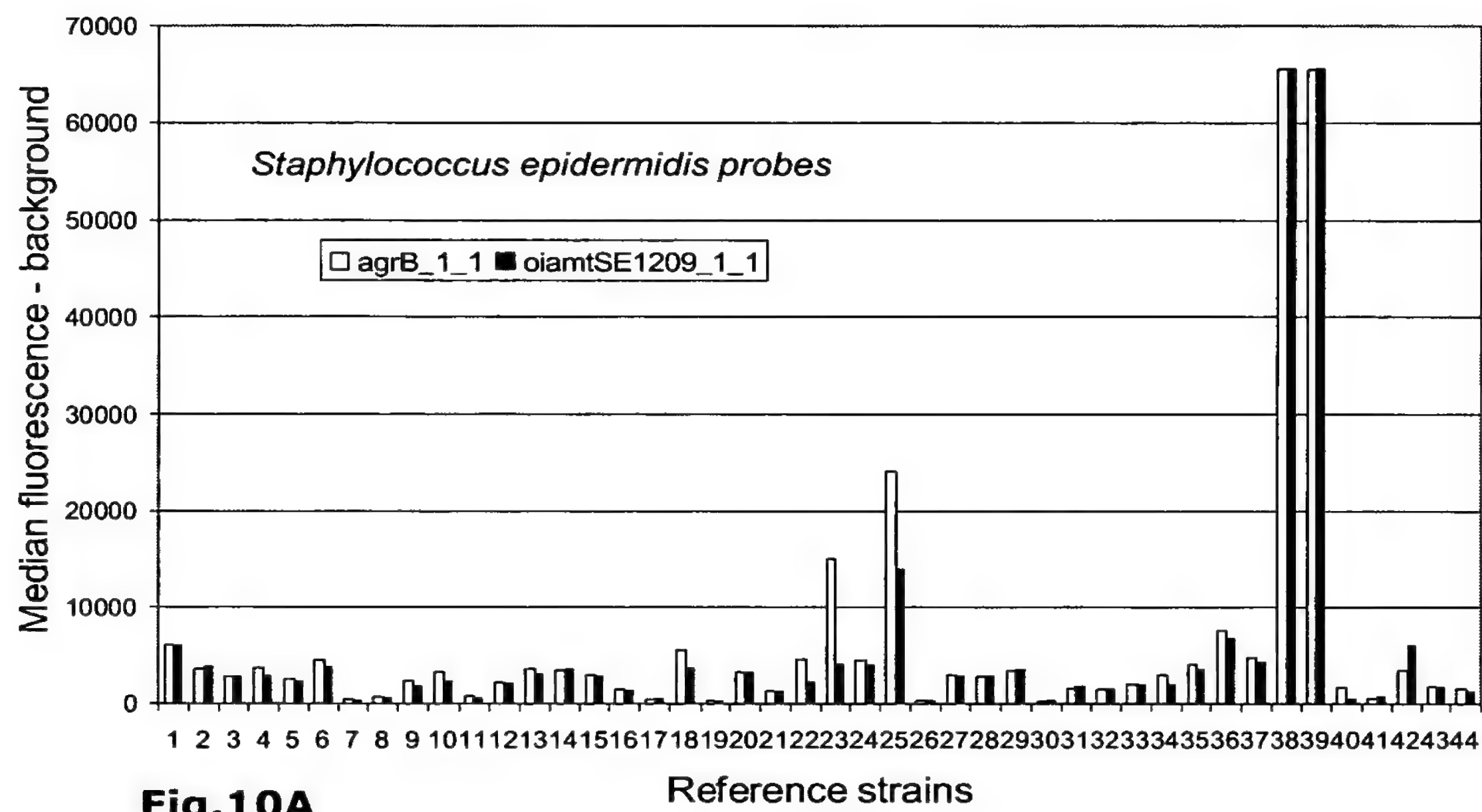


Fig.10A

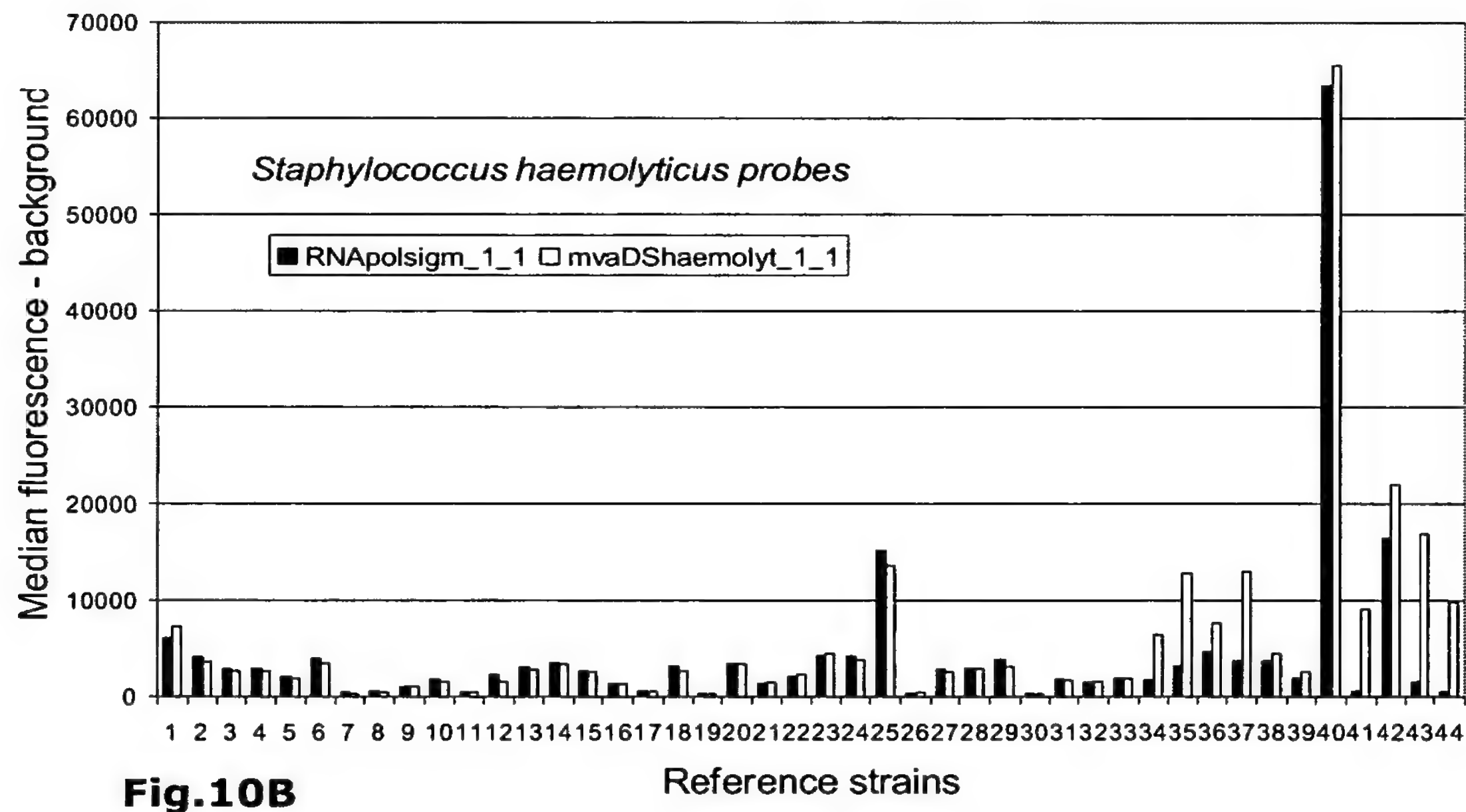


Fig.10B

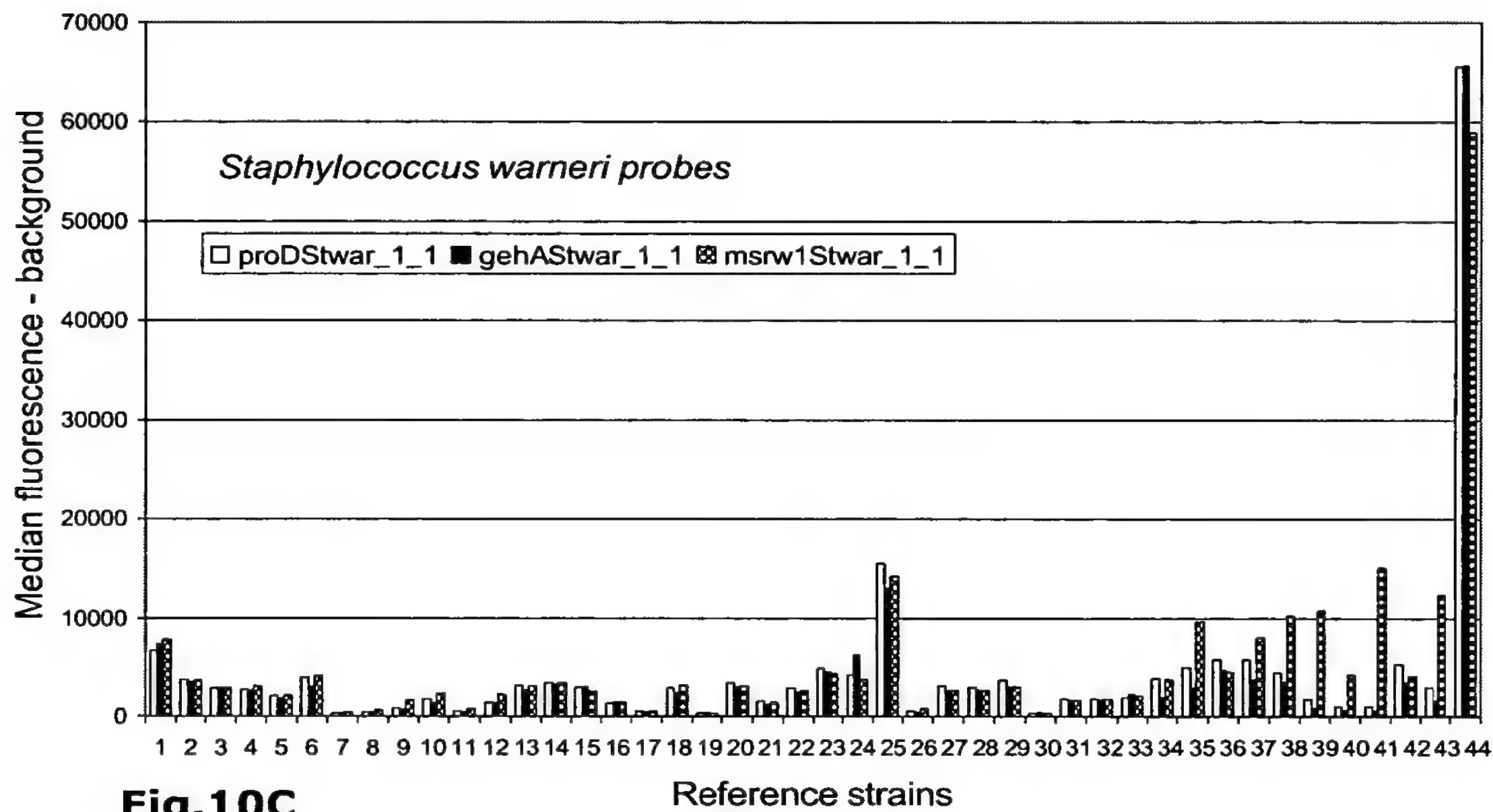


Fig.10C

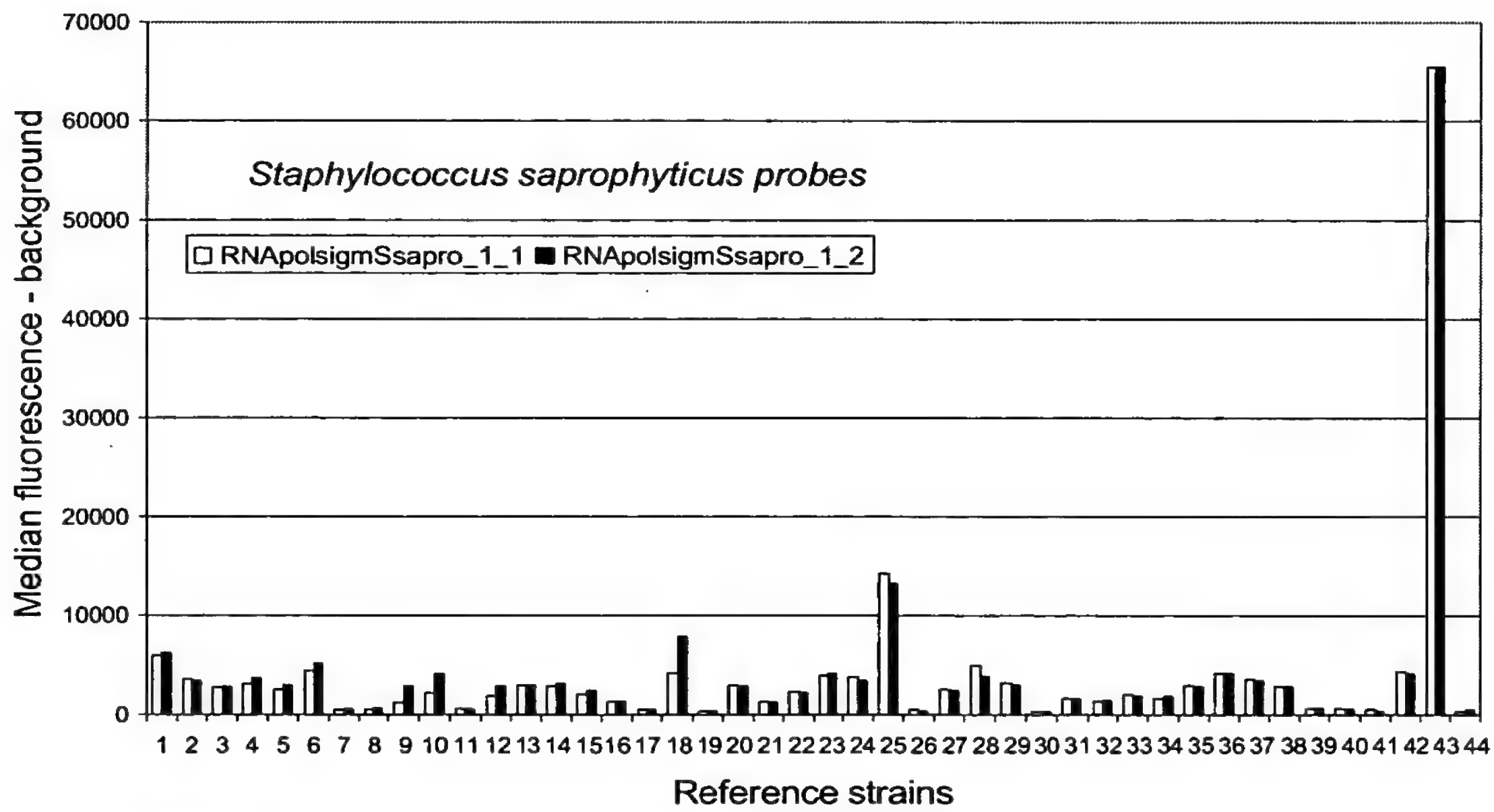


Fig.10D

SEQUENCE LISTING

<110> Universität zu Köln

<120> analytical device for rapid identification of pathogens

<130> 062148wo/JH/PCH

<150> EP 05109025.6

<151> 2005-09-29

<160> 3042

<170> PatentIn version 3.3

<210> 1

<211> 220

<212> DNA

<213> Staphylococcus aureus

<400> 1

taaattgttt agattacaat cagaggacgc taaagaaaga atttttacaa atacagcaaa 60

tgcaatggaa ggcgtaacgg atgatgttaa acgacgtcat attcgtcatt gttacaaagc 120

tgaccagaa tatggtaaag gtgttgcaaa agcattaggt attgatataa attctattga 180

tcttgaaact gaaaatgatg aaacatacga aaactttgaa 220

<210> 2

<211> 543

<212> DNA

<213> Staphylococcus aureus

<400> 2

cgtgtttggg ttaaattcca ttttagaacg caacaaggta ttgaaaactt aactgatgaa 60

gaagctgctg aaattatagc tacagatcgt gattcatctc aacgcgattt attcgaagcc 120

attgaaaaag gtgattatcc aaaatggaca atgtatatcc aagtaatgac tgaggaacaa 180

gctaaaaacc ataaagataa tccatttgat ttaacaaaag tatggtatca cgatgagtat 240

cctctaattg aagttggaga gtttgaatta aatagaaatc cagataatta ctttacggat 300

gttgaacaag ctgcgtttgc accaactaat attattccag gattagattt ttctccagac 360

aaaatgctgc aagggcggtt attctcatat ggcgatgcgc aaagatatcg attaggagtt 420

aatcattggc agattcctgt aaaccaacct aaaggtggtg gtattgaaaa tatttgtcct 480

tttagtagag atggtcaaat gcgcgtagtt gacaataacc aaggtggagg aacacaccat 540

tat 543

<210> 3
<211> 701
<212> DNA
<213> Staphylococcus aureus

<400> 3
aaaagaaaaa cacgcaattc ggaaaaaatc gattggcgtg gcttcagtgc ttgtaggtac 60
gttaatcgggt tttggactac tcagcagtaa agaagcagat gcaagtgaaa atagtgttac 120
gcaatctgat agcgcaagta acgaaagcaa aagtaatgat tcaagtagcg ttagtgctgc 180
acctaaaaca gacgacacaa acgtgagtga tactaaaaca tcgtcaaaca ctaataatgg 240
cgaaacgagt gtggcgcaaa atccagcaca acaggaaacg acacaatcat catcaacaaa 300
tgcaactacg gaagaaacgc cggtaactgg tgaagctact actacgacaa cgaatcaagc 360
taatacaccg gcaacaactc aatcaagcaa tacaaatgcg gaggaattag tgaatcaaac 420
aagtaatgaa acgactttta atgatactaa tacagtatca tctgtaaatt cacctcaaaa 480
ttctacaaat gcggaaaatg tttcaacaac gcaagatact tcaactgaag caacaccttc 540
aaacaatgaa tcagctccac agagtacaga tgcaagtaat aaagatgtag ttaatcaagc 600
ggttaatata agtgcgcta gaatgagagc atttagttta gcggcagtag ctgcagatgc 660
accggcagct ggcacagata ttacgaatca gttgacgaat g 701

<210> 4
<211> 700
<212> DNA
<213> Staphylococcus aureus

<400> 4
tagcatagca acaaacagtg agcttaaaaa ttctcaaaca ttagatttac cacaatcatc 60
accacaaacg atttccaatg cgcaaggaac tagtaaacca agtgttagaa cgagagctgt 120
acgtagttta gctgttgctg aaccggtagt aaatgctgct gatgctaaag gtacaaatgt 180
aaatgataaa gttacggcaa gtaatttcaa gttagaaaag actacatttg accctaataca 240
aagtggtaac acatttatgg cggcaaattt tacagtgaca gataaagtga aatcagggga 300
ttattttaca gcgaagttac cagatagttt aactggtaat ggagacgtgg attattctaa 360
ttcaaataat acgatgccaa ttgcagacat taaaagtacg aatggcgatg ttgtagctaa 420
agcaacatat gatatcttga ctaagacgta tacatttgctc ttacagatt atgtaaataa 480
taaagaaaat attaacggac aattttcatt acctttatctt acagaccgag caaaggcacc 540

taaatcagga acatatgatg cgaatattaa tattgcggat gaaatgttta ataataaaat 600
 tacttataac tatagttcgc caattgcagg aattgataaa ccaaatggcg cgaacatttc 660
 ttctcaaatt attggtgtag atacagcttc aggtcaaaac 700

<210> 5
 <211> 635
 <212> DNA
 <213> Staphylococcus aureus

<400> 5
 aacaaagcag atgcgatagt aacaaaggat tatagcaaag agtcaagagt gaatgagaac 60
 agtaaatatg ggacattaat ttcagactgg tatttaaaag ggagattaac tagtctagaa 120
 tctcaattta tcaatgcatt ggatatttta gagacatatc attatggcga aaaagagtat 180
 aaagatgcaa aagataaatt gatgacaaga attttagggg aagaccaata ccttttagaa 240
 agaaaaaaag tgcagtatga ggaatacaaa aaattatacc aaaaatataa agaagagaat 300
 ccaacctcta aaggcttaaa actgaaaaca ttcgatcaat atacaataga agatttaact 360
 atgaggggaat ataatgagtt aacagaatca ttaaaaagtg ctgtaaaaga ctttgagaaa 420
 gatgttgaaa aaatagaaaa tcaacatcat gatttgaaac catttactga tgaaatggaa 480
 gagaaggcta cttctagagt tgatgattta gcaaataaag catatagtgt ttattttgca 540
 tttgttaggg atacacaaca taaaactgag gcattagagt taaaagcgaa agtagattta 600
 gtttttaggtg atgaggataa accgcacgt atttc 635

<210> 6
 <211> 532
 <212> DNA
 <213> Staphylococcus aureus

<400> 6
 ctaggcgcag tagcagttgc atctagctta tttacatggg ataacaaagc agatgcgata 60
 gtaacaaagg attatagcaa agagtcaaga gtgaatgaga acagtaaata tgggacatta 120
 atttcagact ggtattttaa agggagatta actagtctag aatctcaatt tatcaatgca 180
 ttggatattt tagagacata tcattatggc gaaaaagagt ataaagatgc aaaagataaa 240
 ttgatgacaa gaatttttag ggaagaccaa taccttttag aaagaaaaaa agtgcagtat 300
 gaggaataca aaaaattata ccaaaaatat aaagaagaga atccaacctc taaaggctta 360
 aaactgaaaa cattcgatca atatacaata gaagatttaa ctatgaggga atataatgag 420

ttaacagaat cattaaaaag tgctgtaaaa gactttgaga aagatggtga aaaaatagaa 480
aatcaacatc atgatttgaa accatttact gatgaaatgg aagagaaggc ta 532

<210> 7
<211> 268
<212> DNA
<213> Staphylococcus aureus

<400> 7
aatgctgcta acctgctga taaacaaaca aaacttgaaa agcaatatga agaagctaaa 60
aatgaatgga agaatgcaca aaatggcatg tcaacttcat tgtcagaaga agatattgct 120
gaagttattg caggatggac aggtatccca ttaactaaaa tcaatgaaac agaattctgaa 180
aaacttctta gtctagaaga tacattacat gagagagtta ttgggcaaaa agatgctggt 240
aattcaatca gtaaagcggg tagacgtg 268

<210> 8
<211> 321
<212> DNA
<213> Staphylococcus aureus

<400> 8
aaagtaaaga gtagactaag cagtctgctc tttttgtatg agtaaaccga ggtgtcaata 60
aattgtttac tatactttga gcggaaatat gattgaatga agctagttga accgtaacta 120
tatgaaatgt tcccttcaaa gtagacattg aaaggaacat ttcaatcctt tgtttgtaag 180
tcgctctaga cattacattt agtacatatg ttgtttctaa tgctcattaa tggatttgat 240
tattctttta ttaaattctt aagtgccatt tttaaattac tatattttaa ttggaatccc 300
aatgcttgaa ttttattagg t 321

<210> 9
<211> 350
<212> DNA
<213> Staphylococcus aureus

<400> 9
aagaatttaa aatgggttagg tgctgtagca acgttaatga tgacatttgt acaacttggt 60
ggagccttag ttaccaaacc cggatcagct gatgggtgtg gttcttcttg gccactatgt 120
catggtgctg tgattccaga attctttcct attgatacga ttattgagtt aagtcataga 180
gccgtttcag ctttgtcttt attaattggtc ttatgggttag ttatcactgc atggaaacat 240
ataggctata ttaaagaaat taaaccttta tcaatcatta gtgttggtt cttattattg 300

caagcattaa tcggagctgc tgctgttatt tggcaacaaa acgattacgt 350

<210> 10
<211> 357
<212> DNA
<213> Staphylococcus aureus

<400> 10
aacgtcccat accattaatt ttagaaatta agaatcctaa aacattaatg attaaaggta 60
aaatctttgt gtattgaagg ataccgataa tcgctgaaat aaatacgata ggtaataata 120
cactgaagaa gaatgggtggg tgcttaggat cgatatattg aataccaccg aatacaaagt 180
taacaccatc tgctgctttt aataataagt agttaaaacc gtttgaaata ccaccaataa 240
ccttgattcc cattgtagtt ttaagcaaga taaatgcaaa gataagctga attgcaagta 300
aaattcctac atatttccag cgaatatattt tcctgtctga gctaaataga aacgcaa 357

<210> 11
<211> 336
<212> DNA
<213> Staphylococcus aureus

<400> 11
acagagcagc aaaagcgtta gtaaaccggt tcccaagtgc gacgatttac aacacatatg 60
gtccaactga agctacggta gcagttacaa gtattcaaata tacacaagaa atcttagatc 120
aatatccgac attacctgtt ggcgttgaaa gaccaggcgc aagattatct actacagatg 180
aaggtgaact tggtatcgaa ggtcaaagtg taagttagg atacttaaaa aatgaccaaa 240
aaacagctga agtatattaat ttcgatgacg gtattcgtac atatcacact ggtgataaag 300
cgaagtttga aaatgggtcaa tgggttcattc aaggtc 336

<210> 12
<211> 340
<212> DNA
<213> Staphylococcus aureus

<400> 12
catatgggtga ttttacattc ttcttaattg ctttaattgc attattacca gtcattatac 60
ttggattttt aggtaaagca agttacattt ataatggcgt agttacagca tttatgattg 120
tggttaatctt ttcttctgat aaacataatc tgtttgacca aaagtattta agtggttcaat 180
taattagttt tattatttac gtcgtatggc aagttttatt gataatgttt tattatcatt 240

caaaacaaaa aaataattca ttttcaaaat ttgtaactgt aatgggttta tcaatattgc 300
cattagcact tgtgaaagtg ttacaaagta catgggttagg 340

<210> 13
<211> 210
<212> DNA
<213> Staphylococcus aureus

<400> 13
aaatttatta gcagaagtag cagaaaaatga tattgtaaaa gaaaatccag acgtagaaat 60
ttttgaagaa ggtattattg attctttcca aacagttgga ttattattag agattcaaaa 120
taaacttgat atcgaagtat ctattatgga ctttgataga gatgagtggg caacaccaaa 180
taaaatcggt gaagcattag aagagttacg 210

<210> 14
<211> 262
<212> DNA
<213> Staphylococcus aureus

<400> 14
tttaggcgaa aatatcggtg aagaagataa aaaatctgct gaagagaaaa aagacgctct 60
taaaactgct ttagaaggtc aagatataga agatattaaa tctaaaaaag aagaacttga 120
aaaagtgatt caagaattat cagcaaaagt atatgagcaa gcggtcaac agcaacaaca 180
agcacaaggt gcaaatgctg gtcaaaacaa cgatagtact gtagaagatg ctgaatttaa 240
agaagtaaaa gacgacgaca aa 262

<210> 15
<211> 224
<212> DNA
<213> Staphylococcus aureus

<400> 15
ggctcttatcg ttgcagctat cactatttca tcaactaggga gcttaagtgg actattagtg 60
ccactgttta ctggacgaat thtagataaa ttttccgtga gccatatcaa ttggaatcta 120
atcgcattat ttggtggtat ctttgttatc aatgctttat taagcggatt aggtttatat 180
ttattaagta aaattggtga aaagattatt tatgcgatac gctc 224

<210> 16
<211> 435
<212> DNA
<213> Staphylococcus aureus

<400> 16
tcaggtgaaa tgtagaatc agcattaata gctggtttga tttcaattgg tgcagaagtg 60
atgcgattag gtattatttc aacaccaggt gttgcatatt taacacgcga tatgggtgca 120
gagttaggtg taatgatttc agcctctcat aatccagttg cagataatgg tattaaattc 180
tttggatcag atggttttaa actatcagat gaacaagaaa atgaaattga agcattattg 240
gatcaagaaa acccagaatt accaagacca gttggcaatg atattgtaca ttattcagat 300
tactttgaag gggcacaaaa atatttgagc tattttaaact caacagtaga tgttaacttt 360
gaaggtttga aaattgcttt agatggcgca aatggttcaa catcatcact agcgccattc 420
ttatttggtg actta 435

<210> 17
<211> 426
<212> DNA
<213> Staphylococcus aureus

<400> 17
tagtcaccat gaagttgccc ctggtcaaca tgaaattgac tttaaataatg cagatgctgt 60
tacagcatgt gataatatcc aaacatttaa attggttggt aaaacaatcg cacgtaaaca 120
taatttacac gcaacattta tgcctaaacc attatttggt gtgaatggta gcggtatgca 180
ctttaacggt tcattattca aaggtaaaga aaatgcattc tttgatccga atactgaaat 240
gggcttaaca gaaacagctt accaattcac agctggtgta cttaaaaacg cacgtggatt 300
tacagcggta tgtaaccat tagtaaaactc atacaaacgt ttagttcctg gttatgaagc 360
accatgttat attgcatgga gcggtaaaaa ccgttcaccg ttaatccgtg taccatcttc 420
aagagg 426

<210> 18
<211> 339
<212> DNA
<213> Staphylococcus aureus

<400> 18
cgaatgatgc aatcagacga aatatggctg tcttctctat gagtgtagta agtaagttaa 60
cggatttaac gccaaaggcaa atacgttact atgaaacaca tgaactcatc aaacctgaaa 120
gaacagaagg tcaaaaacgt ctgttctcac tcaatgattt ggaaagatta ctagaaatta 180
aatcattatt agaaaaagga tttaatatca aagggattaa acaaatcatt tatgactcac 240

aagagcattt aacaacagat gaacaagaga taagaaaaaa gatgattgta gatgccacgc 300
aaaagcctat tggagaaact ttgccaataa atcgtggtg 339

<210> 19
<211> 390
<212> DNA
<213> Staphylococcus aureus

<400> 19
ttgaatcacc aaattgaggt tgttgcaa at agaacgaagt ttgaattaga taatgcagaa 60
aaacgtatgc atatcggtga aggtttgatt aaagcggtgt caattttaga taaagtaatc 120
gaattgattc gtagctctaa aaacaagcgt gacgctaaag aaaaccttat cgaagtatac 180
gagttcacag aagaacaggc tgaagcaatt gtaatgttac agttatatcg tttaacaaac 240
actgatatag ttgcgcttga aggtgaacat aaagaacttg aagcattaat caaacaatta 300
cgtcatattc ttgataacca tgatgcatta ttgaatgtca taaaagaaga attgaatgaa 360
attaataaaga aattcaaata tgaacgactg 390

<210> 20
<211> 415
<212> DNA
<213> Staphylococcus aureus

<400> 20
aatccatcg agatggta atatatcatc aaagttttta aaacgggtgt tcgccatctt 60
ctggtttagt gaaaaaagg aaactaaga aaacaggtac caaagtaaca tttaaactg 120
atgacacaat ttttaaagca tctacatcat ttaattttga tgttttaagc gaacgactac 180
aagagtctgc gttcttattg aaaaatttaa aaataacgct taatgattta cgcagtggta 240
aagagcgtca agagcattac cattatgaag aaggaatcaa agagtttggt agttatgtca 300
atgaaggaaa agaagttttg catgacgtgg ctacattttc aggtgaagca aatggtatag 360
aggtagacgt agctttccaa tataatgatc aatattcaga aagtatttta agttt 415

<210> 21
<211> 206
<212> DNA
<213> Staphylococcus aureus

<400> 21
gtatgcaatt tgatcgtggt tatcaatcac cgtatatggt tactgattca gataaaatgg 60
ttgctgaatt agaacgccca tacatttttag taacagataa gaaaatctcg tctttccaag 120

atatcttacc tttattagaa caagtgggtc aatctaatacg tccaatctta attgtagctg 180
atgaagttga aggcgatgca ttaaca 206

<210> 22
<211> 380
<212> DNA
<213> Staphylococcus aureus

<400> 22
tctattttaat ttatttatga attaagttct gtattattca ataactgcta aaatatcttc 60
ttcattttaat accagatatg tttcattatc tcgtttaact tctgtaccag catattgttg 120
gaacacgaca cggccccctt ctttcacttc aggagtcact cttgtaccat catttaatag 180
gogtccagtt cctactgcaa cgataacgcc ttcgtttgat ttttctttag cactatcagt 240
taaaacaata ccacttttag ttgtttgttc ttgttctttt ttctcaataa tcacacgatt 300
tccaattggg tttagcatga ttgttcctcc ttaaaaaacc taaagtttag cacttaacat 360
taaagagtgc taacatacat 380

<210> 23
<211> 496
<212> DNA
<213> Staphylococcus aureus

<400> 23
tgtcatatta tcaacatgta atcgaactga agtatatgct gttgttgatc aaattcacac 60
aggtcgttac tatattcaac gatttctagc tcgtgcattt ggatttgaag tagatgatat 120
taaagcaatg tcagaagtaa aagtggggga cgaagcagta gaacatttat tgcgtgtcac 180
ttctgggttta gattcaatcg tacttggaga aactcaaatt ttaggtcaaa taagagatgc 240
atttttctta ggcgaaagca caggtacgac aggaacaatt tttaatcatc tatttaaaca 300
ggcaattact tttgcaaaaa gagcacataa tgaaacagat atagctgata atgctgtaag 360
tgtgtcttat gctgcggtcg agttggcgaa aaaagtatth ggcaaattga aaagtaagca 420
agctatcatt attggtgcag gggaaatgag tgaattatca ctattaaatc ttcttggttc 480
tggaattact gatatt 496

<210> 24
<211> 619
<212> DNA
<213> Staphylococcus aureus

<400> 24
aaaatgatca aaggtgaaga aacatcacat acacctgttt ggtttatgcg acaagctggc 60
cgttcgcaac cagaatatcg aaaattgaaa gaaaaatatt cactattcga tattacacat 120
cagccggagt tgtgcgctta tgtaacacat ttaccagttg ataattatca tacagatgca 180
gcaattttat acaaagatat tatgacacca ttaaagccaa ttggtgtcga ttagaaaatt 240
aaatcgggta ttggtccagt gattcataat ccaatcaaaa caattcaaga tggtgagaaa 300
ctttctcaaa tagaccccgga acgagatgta ccatatgtat tagatacaat taaactttta 360
acagaagaaa agttaaatgt gccgctaata ggatttactg gggcaccatt tacattagcg 420
tcatatatga ttgaaggcgg accatcgaaa aattacaatt ttacaaaagc gatgatgtat 480
agagatgaag caacatgggt tgctttaatg aatcatttag ttgatgtatc tgttaaatat 540
gtaacagctc aagtcgaagc aggtgccgaa ttgattcaaa ttttcgattc atgggtaggt 600
gcattaaatg tcgaggatt 619

<210> 25
<211> 578
<212> DNA
<213> Staphylococcus aureus

<400> 25
aatgggatta ttagttatgg cttatggcac acctataaaa gaaagtgaca tagagccata 60
ttatacagat attagacatg gtaaacgtcc atctgaagaa gaacttcaag atttgaaaga 120
tagatatgaa tttataggtg gtttatcacc attagcaggt acaacagatg accaggctga 180
tgcgctagtt tcagcattaa ataaagcata tgcagatggt gaatttaaac tatacttagg 240
attaaaacac atttcaccat ttatcgaaga tgcggttgaa caaatgcaca atgatggcat 300
tactgaagca atcacggtag tactagcacc acattattct tcattttcag taggatcata 360
tgacaaacgt gctgatgaag aagctgcaaa atatggtatt caacttacac atgtgaaaca 420
ttattatgaa caacctaaat ttattgaata ttggacgaat aaagtcaacg aaacattagc 480
tcaaataccg gaagaggaac ataaagacac ggtattagtt gtttcggcac atagtttgcc 540
aaaaggttta atcgaaaaga ataatgatcc atatccac 578

<210> 26
<211> 382
<212> DNA
<213> Staphylococcus aureus

<400> 26

atgagatata cgaaatcaga agaagcaatg aaggttgctg aaactttaat gcctgggtggt	60
gtaaatagtc cagtacgcgc atttaaatca gtagatacac cagcaatttt tatggatcac	120
ggtaaagggtt caaaaattta tgatatcgat ggtaacgagt atatcgacta tgtactaagt	180
tggggggccac ttattttagg acatagagac cctcaagtta ttagtcattt acatgaagca	240
attgataaag gtacaagttt tgggtgcatca acattacttg aaaataaatt ggcgcagctc	300
gttattgacc gagtaccttc aatagaaaaa gtgcgtatgg tgtcatctgg tacagaagct	360
acattggata ctttaagatt ag	382

<210> 27

<211> 1099

<212> DNA

<213> Staphylococcus aureus

<400> 27

aaacagcaag atcctaatat tgatgtaacc atctttgaag catcgaatcg tccgggggga	60
aagattcaat cgtatcgtaa agatggttat atgattgaac tagggcctga atcttattta	120
ggtagaaaaa cgattatgac agaattagcg aaagatattg gattagaaca agatattggt	180
acaaatacga ctggacaatc atatattttt gcgaaaaaca aattgtatcc tattccaggt	240
ggatcaatta tgggaattcc gacagatatc aaaccgtttg tgacaactaa attaatttca	300
ccacttggtta aattaagagc aggattagat ttaatcaaaa agcctataca aatgcaagat	360
ggtgacattt ctggttggtgc atttttcaga gcaagattag gtaatgaggt acttgagaat	420
ttaatagagc ctttaatggg tggatattat ggtaccgata ttgataaatt aagtttgatg	480
agtacgtttc ctaattttta agaaaaagaa gaggcattcg gaagtctgat aaaaggatg	540
aaggatgaga aaaataagcg tctgaaacaa agacaattat atcctggcgc accaaaagga	600
caattcaaac aatttaagca tggtttaagt tcatttattg aagcattaga acaagatgtg	660
aaaaataaag gtgtgacaat acgctacaat acgtcagtgg atgatattat tacatctcaa	720
aagcaatata aaattgttta cagtaatcaa caagaagatg tattcgatgg ggtattagtg	780
acaacaccgc atcaagtctt tttgaattgg ttcggacaag atccagcatt tgattacttt	840
aaaacgatgg atagtacgac tgttgcaact gttgtattgg catttgatga aaaagatatt	900
gaaaatactt atgatggtac tggcttcgtg attgcgagaa cgagtgatac agacattacc	960
gcatgtactt ggacatcgaa aaaatggcca tttactacac cagaaggtaa ggttttgatt	1020

cgtgcgtatg taggtaaacc aggtgatact gtgggtgatg atcatacaga taatgaatta 1080
gtatcgattg tacgtagag 1099

<210> 28
<211> 629
<212> DNA
<213> Staphylococcus aureus

<400> 28
attaacaaaa ttgattttacc tgctgcagaa cctgaacgcg tgaacaaga aattgaagat 60
atgatagggt tagaccaaga cgatgttggt ttagcaagtg ctaaattctaa cattggaatt 120
gaagagatac tagagaaaat agttgaagtt gtgccagctc cagatggcga ccagaagca 180
ccactaaaag cgtaaatatt tgattctgag tatgatccat atagaggggt aatttcacgc 240
ataagaattg tagacggtgt tgtaaagcc ggagataaaa ttcgaatgat ggcgactggt 300
aaagagttcg aagtaacaga agttggaatt aatacaccta agcagcttcc agttgatgaa 360
ttaacagttg gtgatgttgg ttatattatt gcaagtatta aaaatgttga tgattctagg 420
gttggtgaca ccatcacatt agctagtaga cctgcatcag aaccattgca aggttataag 480
aaaatgaatc caatggtata ttgcggactg ttccaatag ataacaaaaa ttataatgat 540
ttaagagaag cattagaaaa attacaattg aatgatgcat cattagaatt tgagcctgaa 600
tcgtcacaag cattaggttt tggttatag 629

<210> 29
<211> 265
<212> DNA
<213> Staphylococcus aureus

<400> 29
aaagacgcat caaaaccagc acactttttt caccaagtca ttgtaattgc tttagtactc 60
tttgtatcga aaataattga atcatttatg ccaattccta tgcctggatc agtaatcggt 120
ttagtattat tatttgtatt attatgtact ggtgctgtta agttaggcga agtcgaaaaa 180
gtaggaacga cactaacaaa taacattggc ttactcttcg taccagccgg tatctcagtt 240
gttaactctt taggtgtcat tagcc 265

<210> 30
<211> 278
<212> DNA
<213> Staphylococcus aureus

<400> 30
gattaaccac ttagcactaa atacacctta cttcgggaata ctgttatccg ttataccatt 60
tttcttagcg accatattat ttgaaaaaac taatcgtttc ttcttattcg caccgctatt 120
tgtcagtatg gtatttggtg tggccttctt ctatttaaca ggcattccgt ataagactta 180
caaaataggt ggagacatta ttactttctt cttagaaccg gcaacaatct gttttgcgat 240
tccgttatat aaaaagcgtg aagtgccttg taaacatt 278

<210> 31
<211> 388
<212> DNA
<213> Staphylococcus aureus

<400> 31
cgacaaacac ccaacaagca catacacaaa tgtcaacaca atcacaagac gtatcttatg 60
gtacttatta tacaattgat tctaattggg attatcatca cacacctgat ggtaactgga 120
atcaagcaat gtttgataat aaagaatata gctatacatt cgtagatgct caaggacata 180
cgcattatth ttataactgt tatccaaaaa atgcaaatgc caatggaagc ggccaaacat 240
atgtgaatcc agcaatagca ggagataaca atgactacac agcgagtcaa agccaacagc 300
atattaatca atatgggttat caatcaaatg taggtccaga cgcgagctat tattcacata 360
gtaacaacaa ccaagcgtat aacagcca 388

<210> 32
<211> 203
<212> DNA
<213> Staphylococcus aureus

<400> 32
gttatcgtat taactgggtga aggtgattta gcattctggt ctggtgggtga ccagaagaaa 60
cgtggacatg gtgggttatgt aggtgaagac caaatccctc gcttaaattgt attagattta 120
cagcgtttta ttcgtattat tccaaaaccg gttatcgcca tggtaaaagg ttatgctgta 180
ggtaggcgga atgtactaaa tgt 203

<210> 33
<211> 1434
<212> DNA
<213> Staphylococcus aureus

<400> 33
cgtaagggaa gtagttatca gtccgggatc acgctcaacg ccacttgac ttgcatttga 60

agcacatcca aatattaataa catggatata ccccgatgag cgaagtgcag cattttttgc 120
agttgggtta attaaaggta gtgaaagacc tgtcgctata ttatgtacgt caggtacagc 180
agcagcgaat tatacgctg caattgctga aagccaaatt agtagaattc cattaatcgt 240
tttaacaagt gaccgtccgc atgaattaag aagtgtaggc gcaccacaag cgattaatca 300
agtaaatatg tttaataatt atgtaagtta tgagttcgat atgcctattg cggatgatag 360
taaagagacc attaatgcaa tttattatca aatgcaaatt gctagtcaat atttatatgg 420
accacataaa gggccaattc attttaactt gccatttaga gatccgttaa cacctgattt 480
gaatgcaaca gaattgttaa cttctgagat gaagatttta ccgcactatc aaaaaagtat 540
agatgcatcg gcattaagac acatttttaa taagaaaaaa ggtttaatta ttgtagggga 600
tatgcagcac caagaagttg atcaaatact aacgtattca acgatatatg atttgcctat 660
tttagctgat cctttaagtc atttaagaaa atttgatcat ccgaatgtta tctgtacata 720
tgatttgctg tttagaagcg gcttagactt aaatgtggat ttcgtaattc gtgttgggaa 780
accagtgatt tctaaaaagt tgaatcaatg gttaaagaaa actgatgcat ttcaaatatt 840
agtgcaaac aatgataaga ttgatgtctt tccgatagca ccagatatct catatgagat 900
ttctgcgaat gatttcttta ggtcattaat ggaagacacg accatcaatc gcgtaagttg 960
gttagaaaaa tggcaacgct tagagaaaaa agggcgtaaa gaaattaaat gttatttgga 1020
acaagctaca gatgagagtg cattcgttgg tgaattgatt aagaaaacat ctgaaaaaga 1080
tgcattatct attagtaata gtatgcctat cagagatgta gataacttgt tattgaataa 1140
aaatatagat gtctatgcga atcgtggtgc gaatggatt gatggtatcg tttcaactgc 1200
actgggtatg gctgtgcata aacgaataac attattgata ggtgatttat cattttatca 1260
tgatatgaat ggactattaa tgtcaaaatt aaataatatt cagatgaata ttgtattatt 1320
gaacaacgat ggtggcggtta ttttttcata tttaccacaa aaagaaagtg caactgacta 1380
ttttgaacgg ttgtttggca caccgacggg attggatttc gagtatacag ctaa 1434

<210> 34
<211> 1149
<212> DNA
<213> Staphylococcus aureus

<400> 34
atggactttt gggttatataa acaagcacia caaatggac atcatattgc gataacagac 60


```

ggtcaagaat cttatactta tcaaaattta tactgtgaag cgagtctatt ggctaaaaga 120
ctcaaggctt atcaacaatc tcgtgtcggg ctatacatag ataattcgat tcaatcgatc 180
attttaatac atgcttggtg gttggcaaat attgaaattg cgatgattaa tacaagggtg 240
acacctaatz agatgaagaa tcagatgagg tcaatcgatg tacaattgat tttttgtacc 300
ttgccactgg aattgcgagg gtttcaaatt gtatcgctgg atgatattga attcgctgga 360
acggatatta caatgaacgg tttgttggac aacacaatgg atatccaata tgatacatcg 420
aatgaaactg tgggtgccgaa agagtcgccg tccaacatat taaatacttc atttaattta 480
gatgacattg catcgattat gtttacatca gggacaactg gccctcaaaa agcggtgccg 540
caaacgtttc gtaatcatta tgccagtgc aatcgatgta aagagagctt gggatttgat 600
cgtgatacta attggctatc tgtcttgccg atttatcata tttcgggtct cagtgtactt 660
ttaagagctg ttattgaagg gtttactgtg cgcattgttg ataaattcaa tgccgaacaa 720
attttaacga taattaaaaa tgaacgcac acgcacattt cgcttggtgc acaaacttta 780
aattggctta tgcaacaagg ttacatgaa ccttataatt tgcaaaaaat attactcggc 840
ggtgctaaat tatctgccac ttgatagag acggcattac aatataacct gccaatattat 900
aattcatttg gtatgactga gacatgttca caatttttaa cagcaacacc ggaaatgttg 960
catgcacgtc ctgacactgt agggatgcca agtgccaatg tagacgttaa aattaaaaat 1020
cctaataaag aaggatcatg agaattaatg attaaagggt ccaatgtgat gaatggatat 1080
ttgtatccaa cagatttaac gggtagcttt gaaaatgggt attttaatac gggtagacatt 1140
gctgaaata 1149

```

```

<210> 35
<211> 236
<212> DNA
<213> Staphylococcus aureus

```

```

<400> 35
attgataatt tacatccaac acctgcttta ggtggctatc caaaagaatt tgcatggat 60
tttattgaac agaaagaatt tggtagacga ggattatatg gtgcgccggt tggctatata 120
gatatatatg atgattgtga atttattggt gcaattcggt cgatgcttat taagaaagca 180
caagcaactt tatttgctgg gtgtggcatt gttaaagatt ctgatccaga tagtga 236

```

```

<210> 36
<211> 327

```

<212> DNA

<213> Staphylococcus aureus

<400> 36

```
atgagggtact ctttaattag tggatatcttg atagggtttta ttgcgcctct aatcgggtgct      60
tttatcgttg ttagacgact atcacttata gctgatgctc taagtcatgt aacttttaggt      120
gggtatatctt tcggtatggt ttacttact attatgccaa cactagtatt tattaatcca      180
atgtgggtttg gaatcttatt cgcaatagta ggtgcgcttc taattgaaaa attaagaacg      240
tcatacactg cttaccaaga aattgctatt ccaattataa tgagtgcctgg tatcgccttg      300
agtgcaatct tcatttcatt agctgat      327
```

<210> 37

<211> 195

<212> DNA

<213> Staphylococcus aureus

<400> 37

```
gaaaatacag aacttgatgg tgaaatgaag tttagaatcg cttgtacaaa ccatcatcat      60
catcatttta tctgtgaaaa gtgtggagat acaaaggtaa tagattattg tccaatagat      120
cagataaagt tatcactacc tgggtgttaat attcacaaac acaaacttga agtttatggg      180
gtatgtgagt cttgc      195
```

<210> 38

<211> 313

<212> DNA

<213> Staphylococcus aureus

<400> 38

```
acacagagaa taatcaagag aagacgtttt catctgaaga aagtaacagt aagccattta      60
tggtagaaaa tcaaaacgat gaaatagtta taagagaaga ttcatataat ccattcgtaa      120
cgaaaacgtc tgaaagttta atagctgatg atgaatcttc cggttataat aatacacgtg      180
aaaaagatga agactacttc aaaaagcaac aagaaattct acaagaaatg gatcaaaca      240
ttgattcgaa tgacgatata tctgtgcaaa attatgagaa taaagcgtct gatgattatt      300
atgatgtaaa cga      313
```

<210> 39

<211> 322

<212> DNA

<213> Staphylococcus aureus

<400> 39
ttgtaattca cttaacttca ccaatgcctc aattggtgtc atattagata aattcaaatt 60
tttaatttgt agttcaatct cgctttcttg atcattttca aacaaatcaa atgatgcttg 120
ttcaaagtct ttttgagata aagtatcagt tgtttcttca acacttaagt ttaaattttc 180
ttgattaatt tcaggttcat tttcgaccat ttttaaattt gatatcgatg attttttacc 240
agcagacgct tcaaactcgc ttagaatcac ttgtgctctg ctaataactt tttcaggtaa 300
atcagctaatt ttcgcaactt ga 322

<210> 40
<211> 432
<212> DNA
<213> Staphylococcus aureus

<400> 40
actcaaacag ttagcaagat tgctcaagtt aaaccaaaca acactggtat tcgtgcttct 60
gtttatgaaa aaacagcgaa aaacggtgcg aaatatgcag accgtacgtt ctatgtaaca 120
aaagagcgtg ctcatggtaa tgaaacgtat gtattattaa acaatacaag ccataacatc 180
ccattaggtt ggttcaatgt aaaagactta aatgttcaaa acttaggcaa agaagttaa 240
acgactcaaa aatatactgt taataaatca aataacggct tatcaatggt tccttgggggt 300
actaaaaacc aagtcatttt aacaggcaat aacattgctc aaggtaacatt taatgcaacg 360
aaacaagtat ctgtaggcaa agatgtttat ttatacggta ctattaataa ccgcactggt 420
tgggtaaattg ca 432

<210> 41
<211> 353
<212> DNA
<213> Staphylococcus aureus

<400> 41
ggtgttccaa actcaaaaga tgatataggt actggtgcat acattcacga tgggtgttatt 60
caacaggcaa cacgtattgc taaaaaatg tatgatgact tattaattgt tgcagacact 120
tgtttatgtg aatatactga tcatgggtcat tgtggcgtga ttgatgacca tacacatgac 180
gttgacaatg ataaatcatt gccactgctt gttaaaacag caatttctca agtggaagct 240
ggtgctgata ttattgcgcc aagtaatatg atggatgggt ttgttgctga aattcgtcgt 300
ggattagatg aagccggcta ttacaatatt cctataatga gttatgggtg caa 353

<210> 42
<211> 399
<212> DNA
<213> *Staphylococcus aureus*

<400> 42
aacacaatcg gaaatggttg atacggctga aaagttatca aagctaata agatggatac 60
taagaaaatt acagaacgtg ataagaaaga tttctggatt cagttgcatc ctaaaaaagc 120
aaaagcaatg atgacaaaag aacaagctat gttagcagat ggaagtatta aacaagatca 180
atatgataaa caactgttat cgaaaatcag aaaatcacaa ttagatgaat tgtcttctaa 240
agatttacaa gtttttagcta tttttcgaga gatgaatgca ggaacagttt tagatccaca 300
aatgataaaa aatgaagatg tcagtgaaaa agagtatgca gcagtttctc agcaactttc 360
caaattacca ggtgttaaca cgtctatgga ttgggatag 399

<210> 43
<211> 329
<212> DNA
<213> *Staphylococcus aureus*

<220>
<221> misc_feature
<222> (56)..(56)
<223> n is a, c, g, or t

<220>
<221> misc_feature
<222> (71)..(71)
<223> n is a, c, g, or t

<400> 43
tgacatttca aatcaatcac atcgggtgcaa atggttcaag aaatcaaag aaagcncgca 60
gaagaacttg naaaaagatg gttattctgt tgaagtaatt gacttacgta ctgttcaacc 120
aatcgatggt gatacaattg tagcttcagt tgaaaaaact ggtcgtgcag ttgtagttca 180
agaagcaciaa cgtcaagctg gtgttggtgc agcagttgta gctgaattaa gtgaacgtgc 240
aatcctttca ttagaagcac ctattggaag agttgcagca gcagatacaa tttatccatt 300
cactcaagct gaaaatgttt gggtaccaa 329

<210> 44
<211> 303
<212> DNA
<213> *Staphylococcus aureus*

<400> 44
ctggagatac tattgaagaa gacgatgttt tagctgaggt acaaaacgat aaatcagtag 60
tagaaatccc atcaccagta tctggtactg tagaagaagt tatggtagaa gaaggtagac 120
tagctgtagt tggtagacgtt attgttaaaa tcgatgcacc tgatgcagaa gatatgcaat 180
ttaaagggtca tgatgatgat tcatcatcta aagaagaacc tgcgaaagag gaagcgccag 240
cagagcaagc acctgtagct actcaaactg aagaagtaga tgaaaacaga actgtaaaag 300
caa 303

<210> 45
<211> 302
<212> DNA
<213> Staphylococcus aureus

<400> 45
tagttatcga gattatcaaa gattggtaga taaacttcaa gttcacgata aagagataga 60
cttagcttct agcttacaac aaacaatgct taaaacagat attccacaat ttgatagtat 120
tcaaattggc gttatttcag tggcggcaca aaaagtaagt ggagattatt ttaatttaat 180
tgaccataac gatggcacia tgagctttgc tgttgcagat gtcattggaa aaggatatacc 240
agctgcttta gcaatgagta tgataaagtt tggcatggat tcttatggac actcacaatt 300
ac 302

<210> 46
<211> 254
<212> DNA
<213> Staphylococcus aureus

<400> 46
tgaatcttaa tatagaaaca accactcaag ataaatttta cgaagttaaa gtcggtggag 60
aattagatgt ttatactgtg cctgaattag aagagggtttt aacacctatg agacaagatg 120
gaactcgtga tatttatgtt aatttagaaa atgtgagtta tatggattcg acagggttag 180
gtttattcgt aggtacatta aaagcattaa accaaaatga taaagaacta tacattttag 240
gtgtgtcaga tcgt 254

<210> 47
<211> 191
<212> DNA
<213> Staphylococcus aureus

<400> 47

tctaaagaag attttatcga aatgcgcgtg ccagcatcgg cagagtatgt aagtttaatt 60
cgtttaacac tttctggcgt tttttcgaga gctggtgcta catatgatga tattgaagat 120
gccaagattg cagtttagtga agctgtgaca aatgcagtta aacatgcata caaagaaaat 180
aacaatgtag g 191

<210> 48
<211> 204
<212> DNA
<213> Staphylococcus aureus

<400> 48
tgagatagat gcaatcatgt ttatgggttaa tgccaatgag gaaattggac gaggtgatga 60
atatattata gaaatggtga aaaatgttaa gacaccagta tttttagtat taaataaaat 120
agatttagtg catccagatg aattaatgcc aaagattgaa gaatatcaaa gttatatgga 180
ctttacagag attgtaccta tttc 204

<210> 49
<211> 234
<212> DNA
<213> Staphylococcus aureus

<400> 49
aatataattg ggaagaagta catcaagaag cagaaatttt agaacatcga atttcagatt 60
tatttggtga aaggctggat agcctgttaa atttcccaga aacttgcccg cacggcggtg 120
tgattcctag aaataatgaa tataaagaga aatatataac aacgattttg aattatgaac 180
ctggtgatat cgttacaatc aaacgtgtga gagataagac cgatttgcta atat 234

<210> 50
<211> 251
<212> DNA
<213> Staphylococcus aureus

<400> 50
ttgaattacc aaaattacca tacgcatttg atgcattaga accacatttt gacaaagaaa 60
ctatggaaat tcatcatgac agacatcata acacttatgt tacgaaatta aatgctgcag 120
tagaaggtag agatttagaa tctaaatcta ttgaagaaat tggtgctaatt ttagacagtg 180
taccagctaa catccaaact gctgtacgta ataatggcgg tggacattta aaccattcat 240
tattctggga g 251

<210> 51
<211> 359
<212> DNA
<213> *Staphylococcus aureus*

<400> 51
gcgcattttg aaaaggcata cttgagaata ctaaagtgct tgttacaatt aaagaaccta 60
ctgttgctaa ttttttcatt gtcttgctcc cttatattac aatttgatta catttacatt 120
atcatacgat tacaaaagaa atgcaacaaa atttttgaat cattacattt ttttataaaa 180
atttcacttt agattcacaa taattactta ttttgtcaat ttattttaatg tcaatatggt 240
gattaattaa tagtggtgtc taatgtatat aatatttagg tcatcggtat agtcaacaat 300
aataaggtat ttcgagttga aatttatctt attatttttc cacttttacg tgctatccc 359

<210> 52
<211> 438
<212> DNA
<213> *Staphylococcus aureus*

<400> 52
ttcgttggtc ataggtgcga gtgaactatc aattaaagat ttactacatt taactgagtc 60
acagcggaat attttattct caagccgaat accaaggacg atgagtattt taattgctgg 120
aagttcgttg gcttttagcag gcttgataat gcaacaaatg atgcaaaata agtttggttag 180
tccgactaca gctggaacga tggaatgggc taaactaggt attttaattg ctttattggt 240
ctttccaacc ggtcatattt tattaact agtatttgct gttatttgta gtatttgagg 300
tacgttttta tttgttaaaa tcattgattt tataaaagtg aaagatgtca tttttgtacc 360
gcttctagga attatgatgg gtgggattgt tgcaagtttc acaaccttca tctcattgcg 420
cacgagtgtc gttcaaag 438

<210> 53
<211> 288
<212> DNA
<213> *Staphylococcus aureus*

<400> 53
tattgcctta tttagatgta ttgcttttag gtcgtgctga agcaattaat ctggggatat 60
cgtatgaaaa attaacgcga attctacttg taatagtctc agtttttagtt tctgtgtcaa 120
ctgcattagt aggaccaatt acatttttag gtttattaac tgtaaactta gcgcattgaac 180
taatgaagac gtatgaacat aagtatattt taattgcgac aatttgcttg agttggatta 240

gtttatttag tgcgcaatgg gtagttgaaa atgtgtttga agctacga 288

<210> 54
<211> 431
<212> DNA
<213> Staphylococcus aureus

<400> 54
aatcaaatga tattggaaga tattagcata gatatcgaaa aaggtaaatt gacttcttta 60
attggaccta atggtgcggg taagagtact ttactttcag cgatttgtag gttaattcgt 120
tttgataacg gtgaagtga aatagatgga cggctcatgt ctgattataa aaataatgac 180
ttgtcgaaaa aaatatctat attaaaacaa acaaaccata ctgaaatgaa tattacggta 240
gagcagttgg taaactgtgg acgattccct tattctaaag gtcgtttgac gaaagaggat 300
catgatattg tcaatgatgc gctagatttg ttgcaactac aagatatcag aaatcgtaat 360
attaagtcac tatctggtgg acaacgacg cgtgcatata ttgcaatgac aatagcacia 420
gatactgaat a 431

<210> 55
<211> 437
<212> DNA
<213> Staphylococcus aureus

<400> 55
catgcggtaa caattctgat aaagaacaat caaaatcaga gactaaaggt tctaaagata 60
cagtgaaaat tgaaaataac tataaaatgc gtggcgagaa aaaagatggg agtgacgcta 120
aaaaagttaa agaaactggt gaagtaccaa aaaatcctga aaatgcagtt gtgttagact 180
atggcgcatc agatgtaatg aaagaaatgg gcttatcaga caaagtaaaa gcattaccta 240
aaggggaagg cggtaagtca ttaccgaatt tcttagaatc atttaaagat gataaatata 300
caaacgttgg taatttaaaa gaagtgaatt ttgataaaat tgctgcgacg aaaccggaag 360
taatctttat ctctggacgt acagctaatac aaaagaattt agatgaattc aaaaaagctg 420
cacctaaagc gaaaatt 437

<210> 56
<211> 163
<212> DNA
<213> Staphylococcus aureus

<400> 56
gctgactatg aaggtaaagc tgacatttta aaattagatg ttgatgaaaa tccatcaact 60

gcagctaaat atgaagtgat gagtattcca acattaatcg tctttaaaga cgggtcaacca 120
gttgataaag ttgttgggtt ccaaccaaaa gaaaacttag ctg 163

<210> 57
<211> 471
<212> DNA
<213> Staphylococcus aureus

<400> 57
caattggctt tcgattattg ttgtatctat ttcgatatta ttaattgcaa tagtaatggc 60
atattatttt aaaaaaattg cacgtattaa tacagaaaca gctattttaa gtgttatacc 120
aggagcacta acacaaatgc tggatcatggc tgaacaagac aaacgtgcta atttgtagt 180
tgtagctta acgcaaacat cacgaattat atttgttggt gttttagtac cgttcatttc 240
atattttttt catgatggta acatgcatgc gaatggaaag ttaacaaaag tcttgccttt 300
atcacaagta ttaaacatag ggcaaatagt tatttttagcg atagctatct ttatagttta 360
tctaattatg tctaaaataa agtttccaac atttcaatta ttagcaccac tcattgtatt 420
aattgtttgg aatttttcta caggtttaac atttacacta gatcattggt t 471

<210> 58
<211> 713
<212> DNA
<213> Staphylococcus aureus

<400> 58
cttagatgtc ccatgctgat ataacaattc aatcgcttta tctggatggt tttcaagatg 60
atatttatca atgattaaag ctagtgctcc cgaaacttta ggtgtggcta atgaagttcc 120
agcttgataa atatatcttc cgttattggc agtagttaaa atgttctcct tatgcatata 180
cccttcattc atccatttat ccacaccgaa ttgatttaaa taagcaaattg atcctccggg 240
cgcagcaata tctgtataat tcataccaaa attggaaaac tcagatagat tactcttttg 300
atctgtagat cctactgtaa cgacattgtc catagatgca ggaacatctt tcacttcgcc 360
attaccttga tattcacgct gtaattttag tttctgtttg tcattgacat caataccatc 420
attaccagct gcagcaacaa cgatagattt tttcttcttg gcgtaattga ttgctttctg 480
taacgcatcg tattctactt tttcatcttt tctaaatggt tgatgggtcat ttttgtccaa 540
aataatataa ctaccaacac taatattaat gacttgattt ccatcatttg cagcttgaac 600
aatcgctttt gataccctaa gcagttctgt ttttttacta ccaaacacgc gatacattgt 660

aaatttggtta ttcggtgcaa cacctattaa cttaccatta gcactcgttt gac 713

<210> 59

<211> 738

<212> DNA

<213> Staphylococcus aureus

<400> 59

ttcaataggc gtggtgtcag tgttagcggc tacaatgttt gttgtgtcat cacatgaagc 60

acaagcctcg gaaaaaacat caactaatgc agcggcacaa aaagaaacac taaatcaacc 120

gggagaacaa gggaatgcga taacgtcaca tcaaatgcag tcaggaaagc aattagacga 180

tatgcataaa gagaatggta aaagtggaac agtgacagaa ggtaaagata cgcttcaatc 240

atcgaagcat caatcaacac aaaatagtaa aacaatcaga acgcaaaatg ataatcaagt 300

aaagcaagat tctgaacgac aaggttctaa acagtcacac caaaataatg cgactaataa 360

tactgaacgt caaaatgatc aggttcaaaa taccatcat gctgaacgta atggatcaca 420

atcgacaacg tcacaatcga atgatgttga taaatcacaa ccatccattc cggcacaaaa 480

ggtaataccc aatcatgata aagcagcacc aacttcaact acacccccgt ctaatgataa 540

aactgcacct aaatcaacaa aagcacaaga tgcaaccacg gacaaacatc caaatcaaca 600

agatacacat caacctgcgc atcaaatcat agatgcaaag caagatgata ctgttcgcca 660

aagtgaacag aaaccacaag ttggcgatth aagtaaacad atcgatgggc aaaattcccc 720

agagaaaccg acagataa 738

<210> 60

<211> 780

<212> DNA

<213> Staphylococcus aureus

<400> 60

aggctcgtat gattgaaaaa attgcagagc tcgttcgtga caagaaaatt gacggatatca 60

ctgattttacg tgatgaaaca agttttacgta ctggtgtgcg tgtcggttatt gatgtgcgta 120

aggatgcaaa tgctagtgtc attttaaata acttatacaa acaaacacct cttcaaacad 180

catttggtgt gaatatgatt gcacttgtaa atggtagacc gaagcttatt aattttaaaag 240

aagcgttggt acattattta gagcatcaaa agacagttgt tagaagacgt acgcaatata 300

acttacgtaa agctaaagat cgtgcccata ttttagaagg gttacgtatc gcacttgacc 360

atatcgatga aattatttca acgattcgtg agtcagatac agataaagtt gcaatggaaa 420

gcttgcaaca acgcttcaaa ctttctgaaa aacaagctca agctatttta gacatgcgtt 480
 taagacgtct aacagggttta gagagaaaca aaattgaagc tgaatataat gagttattaa 540
 attatattag tgaattagaa gccatcttag ctgatgaaga agtgttatta cagttagtta 600
 gagatgaatt gactgaaatt agagatcgtt tcggtgatga gcgtcgtaca gaaattcaat 660
 taggtggatt tgaagactta gaggacgaag acttaattcc agaagaacaa atagtaatta 720
 ctttgagcca taataactac attaaacgtt tgccggtatc tacatatcgt gctcaaaacc 780

<210> 61
 <211> 622
 <212> DNA
 <213> Staphylococcus aureus

<400> 61
 ttggcacaac tgataagaca ggtactgtca ttcgttttaa agcagatgga gaaatcttca 60
 cagagacaac tgtatacaac tatgaaacat tacagcaacg tattagagag cttgctttct 120
 taaacaaagg aattcaaatt acattaagag atgaacgtga tgaagaaaac gttagagaag 180
 actcctatca ctatgagggc ggtattaaat cttatgttga gttattgaac gaaaataaag 240
 aacctattca tgatgagcca atttatattc atcaatctaa agatgatatt gaagtagaaa 300
 ttgcgattca atataactca ggatatgcca caaatctttt aacttacgca aataacattc 360
 atacgtacga aggtggtacg catgaagacg gatttaaacg tgcattaacg cgtgtcttaa 420
 atagttatgg ttttaagtagc aagattatga aagaagaaaa agatagactt tctggtgaag 480
 atacacgtga aggtatgaca gcaattatat ctatcaaaca tggatgatcct caattcgaag 540
 gtcaaacgaa gacaaaatta ggtaattctg aagtgcgtca agttgtagat aaattattct 600
 cagagcactt tgaacgattt tt 622

<210> 62
 <211> 756
 <212> DNA
 <213> Staphylococcus aureus

<400> 62
 atcatcagcg acaatgagag atatgggttag agagaatcat gtaagaaaag aagatttaat 60
 atatccaatt tttgtagttg aaaaagacga tgtgaaaaaa gaaattaagt cattgccagg 120
 tgtataccaa atcagtttga atttacttga aagtgaatta aaagaagctt atgacttagg 180
 catacgtgcc attatgtttt tcggtgttcc aaactcaaaa gatgatatag gtactggtgc 240

atacattcac gatggtgtta ttcaacaggc aacacgtatt gctaaaaaaa tgtatgatga 300
cttattaatt gttgcagaca cttgtttatg tgaatatact gatcatggtc attgtggcgt 360
gattgatgac catacacatg acgttgacaa tgataaatca ttgccactac ttgttaaaac 420
agcaatttct caagtgaag ctggtgctga tattattgcg ccaagtaata tgatggatgg 480
ttttgttgct gaaattcgtc gtggattaga tgaagccggc tattacaata ttcctataat 540
gagttatggt gtcaagtatg catcaagttt ctttggacct tttagagatg cagcagattc 600
agcgccatca tttggggata gaaaaacgta tcagatggac cctgctaacc gtttggaagc 660
acttcgtgaa ttagaaagtg atcttaaaga agggcgcgac atgatgattg ttaaacctgc 720
tctaagttat ttagatatag ttcgagatgt taaaaa 756

<210> 63
<211> 200
<212> DNA
<213> Staphylococcus aureus

<400> 63
gtgccaattg caggatatgc tacaatctca gatcaaaacg aaatcgaatt tacaggttta 60
attatgaccc cagatggtaa agaacgattt gaatatacaa tgaacggaac agatccggtt 120
gagttaggca aaacagtgag taacaaatta aaagagcaag gtgcttatga aattataaaa 180
cgcttaaattg aacaacatta 200

<210> 64
<211> 452
<212> DNA
<213> Staphylococcus aureus

<400> 64
ttgataacat tgctgtgata ggaagtaaga cagcgcaata ttgtgaatca cttggcattc 60
gagttgattt tatgccaaac gacttttctc aagaaggatt tttaaaatca tttaatcaaa 120
ctaaccacaaa aatacttttg ccttcgagtg aattggcgag accattgtta ttagcagcgt 180
tatctaaaga taatgaagtt gttaaaatag atttatatac ttcagtgcct aacaaacaaa 240
atatacaaga tgtaaagaa atgatagaac atcaacaaat cgatgcatta acattttcaa 300
gttcgtcggc agtacgttat tattttaatg aaggatttgt accaaaattc aagtcgtatt 360
ttgctattgg agaacaaaca gcacggacca ttaaatacata tcaacaacca gtaacaattg 420
cagaaattca aacactcgaa tcactaattg aa 452

<210> 65
<211> 757
<212> DNA
<213> *Staphylococcus aureus*

<400> 65
tcttccattc tctcagtcaa agaaggttta ttgatacta aaattgcttt actttcttta 60
tttatagctt tgatataatg attcactgga ttgatattcg tataacgcac accatctaca 120
taaccacttg cactgctcc aaatccataa tattcctcat taaaccagta aaccttatta 180
tgttctgatt catggccatc taatgcaaaa ttagatattt cgtattgatg gaaaggagat 240
tgttctatct tagacatcaa caactgatac atgtcagcac ctaaactctc attaggaagt 300
ttaagcaacc cttttctata catattataa aattggggtt taggttcaag tattaagcgg 360
taactcgaaa tatgttgaat atccatatct aaagctagat ctaaactttg ttcaaaatct 420
tcaatcgtct gtttcggtaa atgatacatt aaatctaaac tgattgattt aatacctgcg 480
tttttagcat ttaacaccga agtgtaaata tcttcagtat tgtgcgttct acctaaaaca 540
gacaataact ccggtttgaa tgtttgaacg ccattgaaa ttctatttac tccatatttc 600
tctaatagtt ggactttctc tttagttaac tcatcaggat ttgcttcaaa tgtatactcg 660
cctgtgattg taaacgtatc acgtattgct ttaagtaatc tttccaactg attaatagaa 720
agggccggtg gtgtgccgcc acctacatac atggtct 757

<210> 66
<211> 464
<212> DNA
<213> *Staphylococcus aureus*

<400> 66
agggcaaag ctttcagtaa ctataaatag tggcattata aaatttagtg aattggatag 60
aaaagataat tcaagtaaag ataaaagtaa ttataaagta gttaggaaaa atgatattgc 120
atataattct atgagaatgt ggcaaggggc tagtggtaaa tcaaattata atgggattgt 180
tagccctgca tatactgtgc tttatccaac acaaaatact agctcattat ttattggata 240
taagtttaaa acacatagaa tgattcataa atttaaaatt aattcacaag gattaacatc 300
agatacatgg aacttaaaat ataaacaatt aaaaaatata aatatagata tacctgtatt 360
ggaggaacaa gaaaagatag gtgatttctt taaaaaaatg gatataattga taagtaaaca 420
gaaaatgaaa attgaaatat tagaaaaaga gaaacaatcc tttt 464

<210> 67
<211> 533
<212> DNA
<213> Staphylococcus aureus

<400> 67
gtgccagagt tgagattccc agggtttgaa ggcgaatggg aagagaagca gttgggggat 60
cttacagata gagtaattag gaaaaataaa aacttagaat cgaaaaagcc tttaacaata 120
tccggacagt taggtttaat tgatcaaaca gaatatttta gtaaatacagt ttcgtcgaaa 180
aatctagaaa attatacact aataaagaat ggagaattcg cgtataacaa aagttattct 240
aatggatacc cattaggggc tattaaaaga ttaactagat atgatagtgg tgtattgtcc 300
tctttgtata tttgtttttc tattaaaagt gaaatgtcta aagacttcat ggaagcatat 360
tttgattcga cacactggta tagagaagtt tctggaattg cagttgaggg tgcaagaaat 420
cacggattat taaatgtttc tgtgaatgat ttttttacta ttctaattaa atatccaagt 480
ttagaagaac agcaaaaaat aggcaagttc ttcagcaaac tcgaccgaca aat 533

<210> 68
<211> 721
<212> DNA
<213> Staphylococcus aureus

<400> 68
tgcattctcc attttaatag ctacattact atttttaagt ggtggacaag cacaagcagc 60
tgagaagcaa gtgaatatgg gaaattcaca ggaggatata gttacagcac aatctattgg 120
ggatcaacaa actagggaaa atgctaatta tcaacgtgaa aacgggtgttg acgaacagca 180
acatactgaa aatttaacta agaacttgca taatgataaa acaatatcag aagaaaatca 240
tcgtaaaaca gatgatattga ataaagatca actaaaggat gataaaaaag catcgcttaa 300
taataaaaaat attcaacgtg atacaacaaa aaataacaat gctaataccta gcgatgtaaa 360
tcaagggtta gaacaggcta ttaatgatgg taaacaaagt aaagtggcgt cacagcaaca 420
gtcaaaagag gcagataata gtcaagattc aaacgctaata acaatctac cttcacaag 480
tcgaataaag gaagcaccat cattaaataa gttagatcaa acaagtcaac gagaaattgt 540
taatgagaca gaaatagaga aagtacaacc acaacaaaat aatcaagcga atgataaaat 600
tactaactac aattttaaca atgaacaaga agtgaaacct caaaaagacg aaaaaacact 660
atcagtttca gatttaaaaa acaatcaaaa atcaccagta gaaccaacaa aggacaatga 720

c

721

<210> 69
<211> 416
<212> DNA
<213> Staphylococcus aureus

<400> 69
ttgacagctt tgcattttta taaatatagt gagccattta agtcacaaat tgtaacaccg 60
aaagtcactt taacgcacgc tgattgtttg tttatcgaat tgattgatga caaaggaaat 120
gcatatttcg gggaatgtaa cgcttttcaa acagattggc atgatcatga aacaattgcc 180
tcagtgaac atgtaattga gcaatggctc gaagataata gaaataaatc atttgaaacg 240
tatgaagcag cactaaaatt agtagattca ttggaaaata cgcttgctgc aagggaact 300
attgtcatgg cattgtatca aatgtttcat gtactgcctt cattttcagt agcatatgga 360
gcgacagcga gcggcttata aaataaaca ctagagtcac taaaagcaac aaagcc 416

<210> 70
<211> 400
<212> DNA
<213> Staphylococcus aureus

<400> 70
gtattattgc ttggggtgat gatgaacac tacgtaaaat tgaagcagat gttccaattt 60
attattatgg atttaaagat tcggatgaca tttatgctca aaatattcaa attacggata 120
aaggctactgc ttttgatgtg tatgtggatg gtgagtttta tgatcacttc ctgtctccac 180
aatatgggtga ccatacagtt ttaaatgcat tagctgtaat tgcgattagt tatttagaga 240
agctagatgt tacaatatatt aaagaagcat tagaaacggt tgggtgggtgtt aaacgtcgtt 300
tcaatgaaac tacaattgca aatcaagtta ttgtagatga ttatgcacac catccaagag 360
aaattagtgc tacaattgaa acagcacgaa agaaatatcc 400

<210> 71
<211> 613
<212> DNA
<213> Staphylococcus aureus

<400> 71
tggctatcag taatgtttcg aaagggaat acgcaaagag gtttttcttt ttcgctacta 60
gttgcttagt gttaacttta gttgtagttt caagtctaag tagctcagca aatgcacac 120

aaacagataa cggcgtaaat agaagtgggt ctgaagatcc aacagtatat agtgcaactt 180
caactaaaaa attacataaa gaacctgcga ctttaattaa agcgattgat ggtgatacgg 240
ttaaattaat gtacaaaggt caaccaatga cattcagact attattgggt gatacacctg 300
aaacaaagca tcctaaaaaa ggtgtagaga aatatgggtcc tgaagcaagt gcatttacga 360
aaaaaatggt agaaaatgca aagaaaattg aagtcgagtt tgacaaaggt caaagaactg 420
ataaatatgg acgtggctta gcgtatatatt atgctgatgg aaaaatggta aacgaagctt 480
tagttcgtca aggcttggct aaagttgctt atgtttacaa acctaacaat acacatgaac 540
aacatttaag aaaaagtga gcacaagcga aaaaagagaa attaatatt tggagcgaag 600
acaacgctga ttc 613

<210> 72
<211> 212
<212> DNA
<213> Staphylococcus aureus

<400> 72
atggtcaagc tgctgaagtt gattacattg gtatgccagc agtatgcttt actgaacctg 60
aattagctac agttgggttat tcagaagcgc aagctaaaga agaaggttta gcaattaaag 120
cttctaaatt tccatatgca gcaaatgggc gtgcattatc attagacgat actaacggat 180
ttgttaaact tattacactt aaagaagatg at 212

<210> 73
<211> 763
<212> DNA
<213> Staphylococcus aureus

<400> 73
tggaagacat cgtaaacgta gaaactacgc gagaatttca gaagtattag aattaccaa 60
cttaatagaa attcaaacta aatcttacga gtggttccta agagaagggt taatcgaaat 120
gtttagagac atttctccaa ttgaagattt tactggtaat ttgtcattag agtttgtgga 180
ttaccgttta ggagaaccaa aatatgattt agaagaatct aaaaaccgtg acgtactta 240
tgctgcacct cttcgtgtaa aagtgcgtct aatcattaaa gaaacaggag aagttaaaga 300
acaagaagtc tttatgggtg atttcccatt aatgactgat acaggtagct tcgttatcaa 360
tggtgcagaa cgtgtaatcg tatctcaatt agttcgttca ccatccgttt atttcaatga 420
aaaaatcgac aaaaatgggc gtgaaaacta tgatgcaaca attattccaa accgtggtgc 480

atggttagaa tatgaaacag atgctaaaga tgttgtatac gtacgtattg atagaacacg 540
taaactacca ttaacagtat tgttacgtgc attaggtttc tcaagcgacc aagaaattgt 600
tgacctttta ggtgacaatg aatatttacg taatacttta gagaaagacg gcactgaaaa 660
cactgaacaa gcgttattag aaatctatga acgtttacgt ccaggtgaac caccaactgt 720
tgaaaatgct aaaagtctat tgtattcacg tttctttgat cca 763

<210> 74
<211> 500
<212> DNA
<213> Staphylococcus aureus

<400> 74
ggcagttgta ctcccacatg gtgtcttatt ccgtggtgcc gcagaaggcg tcattcgtcg 60
ttatttaatt gaagaaaaga actacttaga agccgtgatt ggcttaccag tgaatatttt 120
ctatgggaca agtattccaa catgtatctt agtattttaa aaatgttgcc aacaagacga 180
caacgtatta tttatcgatg catccaatga ttttgaaaaa ggaaaaaatc aaaaccattt 240
aagcgatgcc caagtcgaac gtattattga cacatacaag cgtaaagaaa caattgataa 300
atacagttac agtgcgacat tacaagagat tgccgataac gattacaacc taaacatacc 360
gaggtatgtc gatacattcg aagaagaagc gccaatgat ttagatcaag tccaacaaga 420
tttgaaaaat atcgacaaag aaatcgcaga aattgaacaa gaaatcaatg catacctgaa 480
agaacttggg gtgttgaaag 500

<210> 75
<211> 468
<212> DNA
<213> Staphylococcus aureus

<400> 75
tgaatagaaa tactaggacc acaaccggtt atttttcaat agaagaaata gattcaagaa 60
aaagccttga tgaaagagaa acagaaaaaa agtatcctgt gaaaatgata aacaataaaa 120
ttattccaac tgaggagata aaagatgaaa agttgaaaaa ggaaattgaa aactttaagt 180
tttttgtgca atatggcagt tttaaaggaa tagagaatta tgaaaatggg gacatttcct 240
ataattctga agtccttatt tattcagcga aatataaact gaaaaatgat gattataatg 300
ttaaagaatt acgaaaaaga tataatattc caacagaaaa ggcgcctaaa ttgttggtga 360
aagggttcggg ggatttgaaa gggctctcag ttggatataa ggaaattgaa tttatattta 420

tagaaaataa aaaagaaaat atatattttt cagatggatt aaacttaa 468

<210> 76
<211> 512
<212> DNA
<213> Staphylococcus aureus

<400> 76
ggtgtattag ataatgaagg tatgggtttta aatttggata gaaatacacg aacggccaag 60
ggatattatt ttgtagatac tatatatgac aatcatgaaa actcttatag taaaaattat 120
agagttgaga tgaaaaacaa taaaattatt ttattagaca aggtggaaga tcaaaaactt 180
aaagaaagaa tagaaaactt taaatttttc ggacaatatg ccgatttcaa gagtttgaaa 240
agttacaacc atggcgacgt ttcaattaat agtaatgttc caagttatga cgcgaaattt 300
aaaatgagta ataaagatga aaatgttaag caattaagaa gccgttataa cattcctact 360
gataaagctc caatattaaa aatgcatatt gatggggact taaaaggcag ttccgttgga 420
tataaaaagt tagaaataga cttttcaaaa gaagaaaata gcgaattatc aatagtcgat 480
tcattaaatt ttcaacctgc caaaaataaa ga 512

<210> 77
<211> 502
<212> DNA
<213> Staphylococcus aureus

<400> 77
aaccaaaagg cgagagttta aaatcacgag gaatgatatt aaagttagat agaaataaga 60
gaactgctaa aggaagttat attattagag aattgaaaga agataaaaat catgatgttc 120
aaaaaaatga aaagaaatat ccagtgaat tggtgaataa taggatagtt ttggtaaaag 180
atgttaaaga caaaaagtta aaaaatgaaa tagagtcggt tgaattattt tcacaatatg 240
gaaactttta tcattttgat cggaatgaga ttactaatat ttcataataat cctaattgctc 300
ccaattactc tgcagaatat aaaatgaaga aaaatgacag aaacattcaa cagttgaaaa 360
agagatttaa tctaaaaact agcaagacac caaaattatt gtttaaggga tctggagata 420
taaaggggtc ttctgtagga tataaggaaa tagaaatcat atttagtaga agtaaagaag 480
aagcatttat tatgttgaca gc 502

<210> 78
<211> 400
<212> DNA

<213> Staphylococcus aureus

<400> 78

gcgaaagagt cgaaatcagc taatgaaatt tcacctgagc aaattaacca atggattaaa	60
gaacaccaag aaaataagaa tacagatgca caggataagt tagttaaaca ttaccaaaaa	120
ctaattgagt cattggcata taaatattct aaaggacaat cacatcacga agatttagtt	180
caagttggta tggttggttt aataggtgcc ataaatagat tcgatatgtc ctttgaacgg	240
aagtttgaag ccttttttagt acctactgta atcggtgaaa tcaaaagata tctacgagat	300
aaaacttggg gtgtacatgt tccgagacgt attaaagaaa ttgggccaag aatcaaaaaa	360
gtgagcgatg aactaaccgc tgaattagag cgttcacctt	400

<210> 79

<211> 529

<212> DNA

<213> Staphylococcus aureus

<400> 79

cggttacgtt gttcttcagt taagttaggt aaatgtaaaa tttcatagaa agcattttgt	60
tgttctttgt tgaatttggt gtcagctttt ggtgcttggt catcatttag ctttttagct	120
tctgctaaaa ggtagcgct ttggcttggg tcatctttta agctttggat gaaaccattg	180
cgttgttctt cgtttaagtt aggtaaatgt aagatttcat agaaagcatt ttggtgttct	240
ttggtgaatt tgttatccgc tttcggtgct tgagattcat ttaacttttt agcttctgac	300
aataggtttag cactttgact tgggtcatct ttttaagctt ggatgaaacc attgcgttgt	360
tcttcgttca agttaggcat gttcaagatt tcatagaaag cattttgttg ttctttgttg	420
aaattggtgt cagctttcgg tgcttgagat tcgtttaatt ttttagcttc acctaaaacg	480
ttagtgcttt ggcttggatc gtctttaaga ctttgaatga aaccattgc	529

<210> 80

<211> 528

<212> DNA

<213> Staphylococcus aureus

<400> 80

tgatattgga agatattagc atagatatcg aaaaaggtaa attgacttct ttaattggac	60
ctaattggtgc gggtaagagt actttacttt cagcgatttg taggttaatt cgttttgata	120
acggtgaagt gaaaatagat ggacggctca tgtctgatta taaaaataat gacttgtcga	180
aaaaaatatc tatattaaaa caaacaacc atactgaaat gaatattacg gtagagcagt	240

tggtaaactg tggacgattc ccttattcta aaggtcgttt gacgaaagag gatcatgata 300
 ttgtcaatga tgcgctagat ttgttgcaac tacaagatat cagaaatcgt aatattaagt 360
 cattatctgg tggacaacgt cagcgtgcat atattgcaat gacaatagca caagatactg 420
 aatataatatt gctagatgaa ccattaaata atttagatat gaagcatgct gttcaaatta 480
 tgcaaacggt aaaaatgtta ggcataaaaa tgaataaagc gattgtca 528

<210> 81
 <211> 513
 <212> DNA
 <213> Staphylococcus aureus

<400> 81
 ttttgattta tcttctgacg gtttaaaata accattcttt acccattctt cataacgtcc 60
 cgcttcaact tcacgaggat catatcttggt ttctatttcc atttgctata cctcctaaaa 120
 aaataaaaat atccatccta tatacaaata ggacggatat tccgtggtac cacctatatt 180
 caagaaggat gattaatatc aaattcactc ttttaacata attggaataa tcataccaat 240
 actatcatcg tgaaatttga aatgcttcat ctcttcaagc actctagatt atgattaacg 300
 ctcaaacacg tcttagccta ctattaatca cggtcagcta agatactctg tgggctacct 360
 tcagtaagaa aatcatttac atactcacac caaatcatat gctctcttta aaataatttg 420
 aacttactct tcccaaattc tatattaaac tcttaactta tagtataatg attgacaaaa 480
 taagtcaatg tataggtggg aataaaatga atg 513

<210> 82
 <211> 361
 <212> DNA
 <213> Staphylococcus aureus

<400> 82
 tggatataac aatcaaaatc actcaatgct tgcataccgc gttctcggtc agtagggttt 60
 ttgaaactaa tttttaaagc accgtatata tcttcgcgta cttctaagat tcttaagttg 120
 cttatagata tgttatgtaa actcaggata taagtcactt tacttatcat acctgattca 180
 tccggaatgt ctacatatag atcatacgca gtatttagtc cacctagttg tttagcgggt 240
 agtgcgtcgc gatacgattt agcttgggca aaaaatgata acaatttttc agaattcattg 300
 ctttcaatta gtctttctaa atcttgaaac tgacttttta gctgtcgaat catttctaaa 360
 a 361

<210> 83
<211> 731
<212> DNA
<213> Staphylococcus aureus

<400> 83
atgagatacc taacatcagg agaatcacat ggacctcaat taacagttat tgttgaaggt 60
gtacctgcaa atttagaagt taaggttgag gatattaata aagaaatggt taagcgtcaa 120
ggcgggttacg gacgtggacg tcgtatgcaa attgaaaaag atacagtga gattgtttcg 180
gggtgaagaa atggttatac attaggtagc cctattacaa tgggtgttac taatgatgat 240
tttacacatt ggcgaaaaat tatgggccgt gcgccaataa gcgacgaaga acgagaaaat 300
atgaaacgta caattacgaa gccaagaccg ggacatgcag atttacttgg cggatatgaaa 360
tataatcatc gtgacttacg aaatgtatta gaacgttcat ctgccagaga aacagcagca 420
cgtgtagcgg tcggtgcact atgcaaagtt ttattagaac aattagatat cgaaatatac 480
agtcgtgttg ttgagatagg tggcattaaa gataaagatt tttatgattc agaaacattt 540
aaagcaaacc ttgatcgaaa tgacgtccgt gtaattgatg atggcatcgc acaagcaatg 600
cgcgataaaa ttgatgaagc gaaaacagat ggtgattcaa tagggggcgt agttcaagtt 660
gtagttgaaa atatgcctgt tgggtgtaggt agttatgtac attatgatcg taaattagat 720
ggaagaatag c 731

<210> 84
<211> 254
<212> DNA
<213> Staphylococcus aureus

<400> 84
accttcaata ttcgcatcca taagtttcaa tgggtctcaag acacgatcca ttggcctttt 60
accaattgaa acatcgccag acaaaacact ttcaatacct aaaccactta acaaaccagc 120
taacaatcga gtcgttgtgc cagagtttcc agtatataaa acttgatgag gtgtttttaa 180
agctttatat ccaggtgaat tcacaaccaa tttatcttca tcttctttta tatctacgcc 240
taataatcgg aata 254

<210> 85
<211> 716
<212> DNA
<213> Staphylococcus aureus

<400> 85
 tcgaggaatt aacaaaggct aaagggtata caacacatgt ggataacaat gatatgggca 60
 acttgattgt gacgaataaa tatacgccag aaacaacatc aattagtggg gaaaaagtat 120
 gggacgacaa agacaatcaa gatggtaaga gaccagaaaa agtcagtgtg aatttattgg 180
 ctaacggaga gaaagtaaaa acgtttagacg tgacatctga aacaaactgg aagtacgaat 240
 ttaaagactt accgaagtat gatgaaggaa agaaaataga atatacagtg accgaagatc 300
 acgtaaaaga ctacacaaca gacatcaacg gtacgacaat aacgaacaag tatacaccag 360
 gagagacatc ggcaacagta acaaaaaatt gggatgacaa taataaccaa gacggaaaac 420
 gaccaactga aatcaaagtt gagttatatc aagatggaaa agcaacagga aaaacggcaa 480
 tattaaatga atctaataac tggacacata cgtggacagg attagatgaa aaagcaaaaag 540
 gacaacaagt aaaatacaca gtcgatgaat taacaaaagt taatggctat acaacgcatg 600
 tggataacaa tgatatgggt aacttgattg tgacaaataa atatacgccg aaaaaaccga 660
 ataaaccaat ctatcctgaa aaacccaaaag acaaaacacc accaactaaa cctgat 716

<210> 86
 <211> 581
 <212> DNA
 <213> Staphylococcus aureus

<400> 86
 gaacctagcc atcaagacag tacacctcaa catgaagagg aatattataa taagaatgct 60
 tttgcaatgg ataaatcaca tccagaacca atcgaagaca atgataaaca cgatactatt 120
 aaaaatgcag aaaataacac tgagcattca acagtttctg ataagagtga agctgaacaa 180
 tctcagcaac ctaaaccata ttttacaaca ggtgctaacc aatcagaaac atcaaaaaat 240
 gaacatgata atgattctgt aaaacaagat caagatgaac ctaaagaaca tcataatggg 300
 aaaaaagcag cagctattgg tgctggaaca gcaggtgttg caggtgcagc tgggtgcaatg 360
 gctgcttcta aagctaagaa acattcaa at gacgctcaaa acaaaaagtaa ttctggcaag 420
 gcgaataact cgactgagga taaagcgtct caagataagt ctaaagatca tcataatggc 480
 aaaaaagggtg cagcgatcgg tgctggaaca gcaggttttg ctggaggcgc agcaagtaaa 540
 agtgcttctg ccgcttcaaa accacatgcc tctaataatg c 581

<210> 87
 <211> 530

<212> DNA

<213> *Staphylococcus aureus*

<400> 87

tcgtgcatta gtaccatcag gtgcttcaac tggatgaacac gaagctgttg aattacgtga	60
tggagataaa tcacgttatt taggtaaagg tgttactaaa gcagttgaaa acgttaatga	120
aatcatcgca ccagaaatta ttgaagggtga attttcagta ttagatcaag tatctattga	180
taaaatgatg atcgcattag acggtactcc aaacaaagggt aaattagggtg caaatgctat	240
tttaggtgta tctattgcag tagcacgtgc agcagctgac ttattagggtc aaccacttta	300
caaataattta ggtggattta atggtaagca gttaccagta ccaatgatga acatcgttaa	360
tgggtggttct cactcagatg ctccaattgc attccaagaa ttcattgattt tacctgtagg	420
tgctacaacg ttcaaagaat cattacgttg ggggtactgaa attttccaca acttaaaaatc	480
aattttaagc aaacgtgggt tagaaactgc agtaggtgac gaaggtgggt	530

<210> 88

<211> 560

<212> DNA

<213> *Staphylococcus aureus*

<400> 88

cgccaaaata gtgcttcaat atcagatagt tattattggg atatcattaa aaatctagaa	60
ttacaattta ctgctgcatt agatttatta gaagattatc gatattggtga aaaagagtat	120
gaaaaagcaa aagatcaact aatgacaagg atattaagtg aagtcaagta tttacttgag	180
caaaaaatta aagaatatga caagtataaa gatttatata aagaatatat gagtaaaaat	240
ccaacgtcaa aggtaaaaag agcaaatttt gatcaatata atatcgaaga cctaagagaa	300
aaagaatata atgatttact aagttctatt aaagatgcgg tagaaacatt taaatcagat	360
gtacaaaaaa tagaatatga aaataaagag ttaaaatctt attcttacga agaagaaaag	420
aaggctgctt ctagagttga tgatttagca aataaagcgt atagcgttta ttttgcgttt	480
gtaggggata cacaacataa aactgaggca ttagagttaa aagcgaaagt ggatttagtt	540
ttaggtgatg aggacaaacc	560

<210> 89

<211> 462

<212> DNA

<213> *Staphylococcus aureus*

<400> 89

tgaaaaataa attgatagca aaatctttat taacaatagc ggcaattggt attactacaa 60
ctacaattgc gtcaacagca gatgcgagcg aaggatacgg tccaagagaa aagaaaccag 120
tgagtattaa tcacaatatc gtagagtaca atgatggtagc ttttaaatat caatctagac 180
caaaatttaa ctcaacacct aaatatatta aattcaaaca tgactataat attttagaat 240
ttaacgatgg tacattcgaa tatgggtgcac gtccacaatt taataaacca gcagcgaaaa 300
ctgatgcaac tattaataaaa gaacaaaaat tgattcaagc tcaaatctt gtgagagaat 360
ttgaaaaaac acatactgtc agtgcacaca gaaaagcaca aaaggcagtc aacttagttt 420
cgtttgaata caaagtgaag aaaatggtct tacaagagcg aa 462

<210> 90
<211> 584
<212> DNA
<213> Staphylococcus aureus

<400> 90
aatcctcata acgcagaaag agtaaccttg aaatataaat ggaaatttgg agaaggaatt 60
aaggcgggag attattttga tttcacatta agcgataatg ttgaaactca tggtagtctca 120
acactgcgta aagttccgga gataaaaagt acagatgggc aagttatggc gacaggagaa 180
ataattggag aaagaaaagt tagatatacg tttaaagaat atgtacaaga aaagaaagat 240
ttaactgctg aattatcttt aaatctattt attgatccta caacagtgac gcaaaaaggt 300
aaccaaaatg ttgaagttaa attgggtgag actacgggta gcaaatatt taatattcaa 360
tatttaggtg gagttagaga taattgggga gtaacagcta atggtcgaat tgatacttta 420
aataaagtag atgggaaatt tagtcatttt gcgtacatga aacctaacaa ccagtcgtta 480
agctctgtga cagtaactgg tcaagtaact aaaggaaata aaccaggggt taataatcca 540
acagttaagg tatataaaca cattggttca gacgatttag ctga 584

<210> 91
<211> 545
<212> DNA
<213> Staphylococcus aureus

<400> 91
gctggtgtgg tacttatacct agtggcagca tatttgtttg ctaaaccaca tatcgataat 60
tatcttcacg ataaagataa agatgaaaag attgaacaat atgataaaaa tgtaaaagaa 120
caggcgagta aagataaaaa gcagcaagct aaacctcaaa ttccgaaaga taaatcgaaa 180

gtggcaggct atattgaaat tccagatgct gatattaaag aaccagtata tccaggacca 240
gcaacacctg aacaattaaa tagaggtgta agctttgcag aagaaaatga atcactagat 300
gatcaaaata tttcaattgc aggacacact ttcattgacc gtccgaacta tcaatttaca 360
aatcttaaag cagccaaaaa aggtagtatg gtgtacttta aagttggtta tgaaacacgt 420
aagtataaaa tgacaagtat aagagatggt aagcctacag atgtaggagt tctagatgaa 480
caaaaaggta aagataaaca attaacatta attacttgtg atgattacaa tgaaaagaca 540
ggcgt 545

<210> 92
<211> 527
<212> DNA
<213> Staphylococcus aureus

<400> 92
ttaacaatag aacatttaac aaagaagata ggcaacaaaa cgattctcga agatgtatca 60
tttaagctga aacgcggaca aatagttggt ctcgttggag cgaatggtgc aggtaaaaca 120
actttaatga aagttatatt aggttactct agtttccaaa gcgggaattt taatgttatt 180
aacagcaagg acgaaaaaag caatatcggc gcattgattg aaaatccagg aatatatcct 240
tttatgtctg gatatgaaaa cttgaagtta ttgaatgaat caaaaaacac tcaagatata 300
gataaaattg tctcacaact tcatatggat gaatacattc ataaaaaagc taaaacgtat 360
tctcttggtta tgaaacaaaa attaggaatt gctatagcat ttttaaataa acctcaattc 420
attatcttag atgaaccaat gaatggctta gatccaaaag ctgtgcgaga tgtacgtgaa 480
ttgattgtcc aaaaagcgca agaaggtggt actttcttaa tttcgag 527

<210> 93
<211> 645
<212> DNA
<213> Staphylococcus aureus

<400> 93
aaatggttca gtcgtaatgg cgacagggtga agtttttagaa ggtggaaaga ttagatatac 60
atttaciaat gatattgaag ataagggtga tgtaacggct gaactagaaa ttaatttatt 120
tattgatcct aaaactgtac aaactaatgg aaatcaaact ataacttcaa cactaaatga 180
agaacaaact tcaaaggaat tagatgttaa atataaagat ggtattggga attattatgc 240
caatttaa at ggatcgattg agacatttaa taaagcgaat aatagatttt cgcatgttgc 300

atttattaaa cctaataatg gtaaaacgac aagtgtgact gttactggaa ctttaaatgaa 360
 aggtagtaat cagaatggaa atcaacccaaa agttaggata tttgaatact tgggtaataa 420
 tgaagacata gcgaagagtg tatatgcaaa tacgacagat acttctaaat ttaaagaagt 480
 cacaagtaat atgagtggga atttgaattt acaaaataat ggaagctatt cattgaatat 540
 agaaaatcta gataaaactt atggtgttca ctatgatgga gagtatttaa atgggtactga 600
 tgaagttgat tttagaacac aaatggtagg acatccagag caact 645

<210> 94
 <211> 548
 <212> DNA
 <213> Staphylococcus aureus

<400> 94
 ggtattgcat ctgtaacttt aggtacatta cttatatctg gtggcgtaac acctgctgca 60
 aatgctgcgc aacacgatga agctcaacaa aatgcttttt atcaagtgtt aaatatgcct 120
 aacttaaacg ctgatcaacg taatggtttt atccaaagcc ttaaagatga tccaagccaa 180
 agtgctaacg ttttaggtga agctcaaaaa cttaatgact ctcaagctcc aaaagctgat 240
 gcgcaacaaa ataagttcaa caaagatcaa caaagcgctt tctatgaaat cttgaacatg 300
 cctaacttaa acgaagagca acgcaatggt ttcatcctaa gtcttaaaga cgatccaagc 360
 caaagcacta acgttttagg tgaagctaaa aaattaaacg aatctcaagc accgaaagct 420
 gacaacaatt tcaacaaaga acaacaaaat gctttctatg aaatcttgaa catgcctaac 480
 ttgaacgaag aacaacgcaa tgggtttcatc caaagcttaa aagatgaccc aagtcaaagt 540
 gctaacct 548

<210> 95
 <211> 304
 <212> DNA
 <213> Staphylococcus aureus

<400> 95
 gttatcaatt aatacaaccc ctgaagcaat tcgatacatt aaacctgcag attttcatgt 60
 tcctggcgat atttcatctg cagcgttctt tattgttgca gcacttatca caccaggaag 120
 tgatgtaaca attcataatg ttggaatcaa tccaacacgt tcaggtatta ttgatattgt 180
 tgaaaaaatg ggcggttaata tccaactttt caatcaaaca actggtgctg aacctactgc 240
 ttctattcgt attcaataca caccaatgct tcaaccaata acaatcgaag gagaattagt 300

tcca

304

<210> 96
<211> 269
<212> DNA
<213> Staphylococcus aureus

<400> 96
gtagttgaaa atatgcctgt tgggtgtaggt agttatgtac attatgatcg taaattagat 60
ggaagaatag cacaggggtgt cgtagtagtatt aatgcattta aaggtgtaag ttttggagaa 120
ggattttaaag cagctgaaaa gcctggtagc gaaattcaag acgaaattct ctacaatact 180
gaattgggct attatcgtgg gtcaaatacac ttaggtgggt tagaaggcgg tatgtcaaat 240
ggaatgccaa ttatcggttaa tgggtgtaat 269

<210> 97
<211> 305
<212> DNA
<213> Staphylococcus aureus

<400> 97
agacttatta tctaaacgtg gtgaactagc acaaaaaatt ggggaagaaa aattaaaaca 60
aggtacacgt atctatgatc cacaacgtga aaaagaaatg cttaacgact taatcgatag 120
taacaaagga ccattcaacg ataatactat taagcaatta tttaaagaaa ttttcaaagc 180
ctctacagat ttacaaaaat ctgaaaatga aaaacattta tatgtatcac gtaagttgaa 240
acctgaagat acgattgtaa catttgataa tgggggcatt attggagacg gcaataaatc 300
atttg 305

<210> 98
<211> 287
<212> DNA
<213> Staphylococcus aureus

<400> 98
aaaattgctg gtatcgctgc acgtgaagtt aaaggtatct tagacatgaa aggtggctta 60
actgatacat tcactaatgc attctcaagt ggaaataacg ttactcaagg tgtatctgtt 120
gaagttgggtg aaaaacaagc tgctgtagac ttaaaagtaa ttttagaata tgggtgaatca 180
gcacctaaaa tcttccgtaa agtaactgaa ttagtaaaag aacaagttaa atatattact 240
ggtttagatg ttgttgaagt taacatgcaa gttgacgatg taatgac 287

<210> 99
<211> 429
<212> DNA
<213> *Staphylococcus aureus*

<400> 99
agctgagacg acacaagatc aaactactaa taaaaacggt ttagatagta ataaagttaa 60
agcaactact gaacaagcaa aagctgaggt aaaaaatcca acgcaaaaca tttctggcac 120
tcaagtatat caagaccctg ctattgtcca accaaaaaca gcaaataaca aaacaggcaa 180
tgctcaagta agtcaaaaag ttgatactgc acaagtaa at ggtgacactc gtgctaataca 240
atcagcgcact acaaataata cgcagcctgt tgcaaagtca acaagcacta cagcacctaa 300
aactaacact aatgttacaa atgctgggta tagtttagtt gatgatgaag atgataattc 360
agaaaatcaa attaattccag aattaattaa atcagctgct aaacctgcag ctcttgaaac 420
gcaatataa 429

<210> 100
<211> 536
<212> DNA
<213> *Staphylococcus aureus*

<400> 100
cgggattctc tgcattatcc cccacggcaa caccctaaat aaactcttca atgttataaaa 60
caagacacaa atgactgata atactaagtt tattaatatt gatacgaaca caccaaagta 120
tcgagttaat aaaaagttga gcggtatcaa tggtagagat actacatata tcaacaatat 180
tgtcaccaat aacaacatag cattaaccgg atgtggatta ataattaggt cacctatata 240
agcaataata aatactaaaa agcaatgtac caaaaatgct attgataaaa tgaaaatctt 300
tgctcttatt tcttttgtaa tcgaccaatt attacttaag taataattaa atgatttatt 360
tctcatttca atttttaaata acgaattaca agccatacat aatacaatcg ggatgaaagc 420
aattggccaa atattaaata gttaaagttat atatggtgac acactattcg ctgttcccgt 480
attacttttg gcgaataaga ctgtgaaaat agcaaaacaa agaaatacca gcggac 536

<210> 101
<211> 637
<212> DNA
<213> *Staphylococcus aureus*

<400> 101
ttaattgttc taccgctcca tttattaaat cttttaaaga gtaaaactgc taatagcaac 60

gtgataataa tatagattgc caatgttaat gtaactggta tactcccttc gataaacata 120
 taaacgtaac gtgtagcata tgtgattggg aaatagaacc acgaatgatc tccaagcact 180
 tctaatacaa aataaacgtt aaaaataaac attaaaactc cgacaacaat agccattaca 240
 tctttaatga aaataactaaa aataaaaagt agcagtaata taattacatt gaaaaacaat 300
 gatagccta taaacataag tggtattttc atatcatgtg aatgccacaa taaattaatt 360
 gatgctaata gaatacatat ggctgtaata gtataagtaa aaatcattga tgcatttaac 420
 caatttagcc tattagcttt tctaaaata tgattaaagt gaccaatatt ttcttcaaaa 480
 ttgataactt gatagacgtt tatagaaatt aatagcgatg taattgcatt aaaactcgct 540
 gtaaacaac ttatttgtcg accattccat aaatttacgt ttaaatacca atttataaat 600
 aatataaaca atatggttac aataatgggt acaaatg 637

<210> 102
 <211> 507
 <212> DNA
 <213> Staphylococcus aureus

<400> 102
 aaagataatt gggttgctga aaaaccagtc ctctaaagaa tcgaatgtta agattcatcg 60
 cttggcgtat attacaaact caaaatttga tggcaataac tatatagata gatgggtgtaa 120
 aatcaggaat tctcacattg gtgaatacag ttatattgga tttggtagtg attttaataa 180
 tgtagaagta ggaagatatt gttcgatatc ttcggatgta aaaattgggt taggaaaaca 240
 tcctacacac ttttttagct catcacgat tttttattct aataataatc catttaacat 300
 aaagcaaaag tttatagact ttaatgacca accaagccgt acaacaatta aaaatgatgt 360
 gtggattggg gcaaatgtaa ttattatgga tggtttaaca ataaatactg gtgcagtcac 420
 agcagccggc tcagttgtta ctaaaaatgt aggagcatat gaggttggtg gtgggggtcc 480
 tgcaaaagtg attaagaagc gatttga 507

<210> 103
 <211> 639
 <212> DNA
 <213> Staphylococcus aureus

<400> 103
 caagggtact taaacaaata gaaacaatta aagacgttac ggatgattat aaaattgttg 60
 gaatgaataa ttcacaagct actaataagc gattggaaaa tttagattgt aattatcggt 120

tgtaggtag caaggtagat ccaaaaaata ttcttttctaa attaattaag cgtataagat 180
ttgcaacagg tggtatccga gaaattaaag cttataaacc tgacgtgatt catgcaaag 240
atttcgacgt attattaatg gtctatttaa gcaattataa aaaagctaatt attgtttatg 300
atgcgcatga aatatatgcg aaaaatgcct ttattaataa agttccactt atttcaaagt 360
ttgtagaaag tatagaaaaa cacatagtaa aacatcgtgt taatgccttc gtaacagtaa 420
gtcatgcagc aaaagaatat tatcaatcta aaggatataa gaaggaagcg aatgttatta 480
cgaatgcacc tatttttaaat gatagcagag aatttaaaga aatcgaaaac tttaaagaaa 540
ttgtatatca aggtcaaatt gtaatggaca gaggatatga agagttttatt attgcttcat 600
cagcttttaa acaaaatgct ccttcattca taattcgag 639

<210> 104
<211> 380
<212> DNA
<213> Staphylococcus aureus

<400> 104
actttgtgca attatcagca tgaacatatt tatagtaatc tctacattta ctaaagaagt 60
attagggttc cctatagagc cgggtgtatta ctcaaccatg gttggtatag cattaattac 120
cacggtgttt gctattttata agataattgt cacgcaagaa attccgagag ggttaatat 180
attaattgct atatgtttgc tttatctagc tttttattat ttttcaccag ataaggaaga 240
gaaactagct aaaaataata ttctattctt tttaacatgg gcagttccag cggcaattag 300
tggtatttat attaaatata taaacaaggc tacggtagaa agatttttta aattagtatt 360
tttcatattt tctgtttcat 380

<210> 105
<211> 500
<212> DNA
<213> Staphylococcus aureus

<400> 105
ttatggatag cgtaaagaca ataattggta cgttgcttat agcttttagga ttacaatttt 60
tagcttatcc aattattaat caacgagtag gtaatgaagc gtttggttct attttaacga 120
tttatacaat aataacaatc acgagtgttg tattaggcaa tacgcttaac aatatacgat 180
tgattaatat gaatctatac aaatccaatc attactactg gaaatttgtg tcgatacttt 240
taatttcaat tctgattgag agtatagctt taattattgt atttctttac ttttttaatt 300

tgaacacccat cgatattatc tttttaattc tacttaatat tttaatgtgt ttaaggattt 360
atctgaatgt attttttagg atgactttaa aatataatca gattttgtat attgctctta 420
ttcaattttt aggtttgctg ataggactat ttctatatta tttaatccaa aactggattg 480
tttgttttat taccagtga 500

<210> 106
<211> 522
<212> DNA
<213> Staphylococcus aureus

<400> 106
gattcttggc gctactaaca ttaagcatat gtcattatta tcacattatt taaaccacat 60
tgatttgaat atcaatgagg tggacattat atacactgac aaatatgata tcgaagaaca 120
tatccaaggc atcaataatt actataaata taaagtagat attaaagaag attggacatt 180
tatcaaaaaa gctattgctt actatcgatt taggccatac gctatgaaaa ttcttaaaga 240
aaatcgttat gattttgtca tagtatgggg aagttataca ggacacttat ttaaaagttt 300
tttagaaaaa cactataaaa ataaattcat tttaaataata agggactact tttttgaaaa 360
taataaactt attaagtata gaatgaaaaa aatcgttgat gctagcaggg tgacaacatt 420
atcttcagaa ggttttctta aatttttacc taaatctgaa aaatatagaa ttatttatag 480
ttataacatg agtattatta gagaaagtaa tgtaaccgat gg 522

<210> 107
<211> 655
<212> DNA
<213> Staphylococcus aureus

<400> 107
taatgtttcc ttgccttatg ttaggtgata aacctttatt attttttagca cctataagtt 60
atggagtagg aaagctcttt ataagcttct cgaataatcc gaattttaaa ttttcgaaaa 120
ttgtatacga tgttttaggt tttcttagat tagtatattat acctgctatg atagtgtttt 180
tccaggattc aactatagat aatttaccat taggacaagc ttattttaat caagcggtta 240
tttatatgag tgtggagttt atcataggct cgctatttat attgatacta tctaaattat 300
tcaaacatga agtggtatca agaaatagct ttacactttc tggatcatca atttattaca 360
ttgtgtttgg tcttgttatt tgtgggattt ttgtagcttt tcccgaagtg cgcaaaaaca 420
tatcattttt aattattaaa acagatgcaa tgggaagagg aaccgaagca acaagtggtt 480

taaatgttct ttttgtaatg ctatttcaac ttgccttagc gttattattc ttaataatcg 540
catatgcttc atataaaaag tataaagaga atcctaaaat tatttatgtt gtattaccgc 600
tagctatagg aattttaaat attagtttaa ttggttggtga aagaagaagt tatca 655

<210> 108
<211> 459
<212> DNA
<213> Staphylococcus aureus

<400> 108
gtaaaaacat ttatgaaatc gaaaatattt agattaatga atacaccact attattattt 60
tataagaaag aatattttaac tggatattat tttgaaaata aagtggctgg atggttatgg 120
gcgtggaaag ctgttccggt caagttgtta ggaataaata caagtttgcc atttcctgca 180
gatataactg ttagaatgca taaccctaata aacattgttt ttgataaaaa tgatattcat 240
atttttcaat cgcccgggac gtatttttaata aatttttcag cagttatata tataggtaga 300
gggtgtttata tagcgcttaa cgtaggtatt attacagcta atcataatat taaaaatttg 360
aagtcacatg caccagggtga agatgtcaaa atagggaatt atagttggat tggaatgaac 420
tcagttatat taccaggagt agaattgggg gaacataca 459

<210> 109
<211> 562
<212> DNA
<213> Staphylococcus aureus

<400> 109
aagatacgat ttgttgattg tgaataccaa aatgaccgt agtgctaata tactttcaca 60
aatcagtttt ttgatatcat tgcttatttt attaatactg ataccaatat ttgcgattag 120
tgcatgttta tacccaaact ttatattaga ttttattttc attattatta tggtgttttt 180
ggtaagttta acaaacattt ttacaaatta tctaaataag gaaagaaagt ataaagtgtt 240
aagtttgatt aatgtgttta gagctggatc aatggcttta cttcaaatca ttttcggact 300
tttagcatta ggaagtttag gattaattat tggtttttca ttatcctata tcgcaggcat 360
tacactagga tataaaacgt ttaaaaagca ctttaatat gtagagata aagaagaaac 420
taaagcatta tttttagaaa ataaaaatca gttagtttat tcaacaccat caatattatt 480
aaatagtttg tctttctcgg ttgttggtgt ctttataggt attttgtata ccaatacaga 540
agtgggtatt tatggtatgg cc 562

<210> 110
<211> 104
<212> DNA
<213> Staphylococcus aureus

<400> 110
ttttatctta attaaggaag gagtgatttc aatggcacia gatattcattt caacaatcag 60
tgacttagta aaatggatta tcgacacagt gaacaaattc acta 104

<210> 111
<211> 351
<212> DNA
<213> Staphylococcus aureus

<400> 111
aaatatcaaa tcgctgtggc tgatacgaat gttcaaacgc cagattatga aaagttgagg 60
aacacatggc tggacgttaa ctatggttat gataagtatg atgagaagaa tgacgcaatg 120
aagaagaagt ttgaggctac ggagaatgag gcaaagaaat tacttagtga gatgaaaact 180
gaaagtgata ggaaatactt gtgggaaaac tcaaaagatt tagatacgaa gtctgcggat 240
atgactcgta cctatcgtaa tattgagaaa atcgcagaag cgatgaagca taaagatact 300
aagttaaaaa tagatgaaaa caagaagaaa gtgaaagatg cccttgagtg g 351

<210> 112
<211> 278
<212> DNA
<213> Staphylococcus aureus

<400> 112
gggttcttgc tgtctttaag tgattcagag aatacttctt gtgcacgttc tgggtgttcg 60
cgtaatgttt tgatgtattg gttacgttgt tcttctgtga taccttttag atgtaatact 120
tgataaaaag ctttttggtg atctgttacg tagttgtttt gagttgtttg gtgcttagtt 180
gaagtttggt gcgtgttttc actcgctttt gcttcccat ttgaaatcat tntagctaaa 240
gtaattgttg ctgccccaac tagcaacttc gagatata 278

<210> 113
<211> 226
<212> DNA
<213> Staphylococcus aureus

<400> 113
aaagatagtt ctaagataaa tgggtccatta agactcgcag gtggagatat taataagcta 60

gattcaacaa ctcaagacaa agtaagaaga ttagattcat ctatttctaa atctactact 120
cctgaatctg tatacgttta tagactttta aatttagatt atttgacaag tatcggttga 180
tttacaaatg aagatttata taaattacaa cagaccaata atggcc 226

<210> 114
<211> 576
<212> DNA
<213> Staphylococcus aureus

<400> 114
gctagtgc at ttgttattca agacgaactg atgcaaaaa accatgcaaa agcagaagtt 60
tcagcagaag aaataaaaaa acatgaagag aaatggaata agtactatgg tgtcaatgca 120
tttaatttac caaaagagct ttttagtaaa gttgatgaaa aagatagaca aaagtatcca 180
tataatacta taggtaatgt ttttgtaaaa ggacaaacaa gtgcaactgg tgtgttaatt 240
ggaaaaaata cagttctaac aaatagacat atcgctaaat ttgctaattg agatccatct 300
aaagtatctt ttagaccttc tataaataca gatgataacg gtaataactga aacaccatat 360
ggagagtatg aagtcaaaga aatattacaa gaaccatttg gtgcagggtg tgatttagca 420
ttaatcagat taaaaccaga tcaaaacggg gtttcattag gcgataaaat atcgccagca 480
aaaataggga catctaataa tttaaaagat ggagacaaac tcgaattaat aggctatcca 540
ttcgatcata aagttaacca aatgcacaga agtgaa 576

<210> 115
<211> 630
<212> DNA
<213> Staphylococcus aureus

<400> 115
ttttagcagc gtcaattttt actatttcct tacctgtgat tccttttgaa agtacattac 60
aagcaaaaga atacagcgca gaagaaatca gaaaattaaa acaaaaattt gaggttccac 120
ctacagataa agagctttat acacacatta cggataatgc aagaagtcct tataattctg 180
ttggtacagt gtttgtcaaa ggtagtacat tagctaccgg agttttaatt ggtaaaaata 240
caattgttac taattaccac gttgcaagag aagcagccaa aaacccatcg aatattatct 300
ttacacccgc tcaaaataga gatgcagaaa aaaatgaatt ccctactccg tatggaaaat 360
ttgaagctga agaaattaaa gaatctccgt atggacaagg actcgattta gctataataa 420
aattaaaacc aaacgaaaaa ggggaatcag cgggagattt aattcaacca gctaataac 480

ctgatcatat tgatatacaa aaaggagaca aatattcttt attaggatat ccttataatt 540
attcagctta ctctttatat caaagtcaga ttgaaatggt caatgattct caatattttg 600
gatatactga ggtaggaaac tctggatcag 630

<210> 116
<211> 330
<212> DNA
<213> Staphylococcus aureus

<400> 116
agaaagaaag tgatttctat gattaanaat aaaatattaa cagcaacttt agcagttggt 60
ttaatagccc ctttagccaa tccatttata gaaatttcta aagcagaaaa taagatagaa 120
gatatcggcc aaggtgcaga aatcatcaaa agaacacaag acattactag caaacgatta 180
gctataactc aaaacattca atttgatttt gtaaaagata aaaaatataa caaagatgcc 240
ctagttgtta agatgcaagg cttcattagc tctagaacaa catattcaga cttaaaaaaa 300
tatccatata ttaaaagaat gatatggcca 330

<210> 117
<211> 350
<212> DNA
<213> Staphylococcus aureus

<400> 117
tcgttacacc gaatggtcaa gtatctgcat atgatcaata cttatttgca caagacccaa 60
ctggtccagc agcaagagac tatttcgtcc cagataatca actacctcct ttaattcaaa 120
gtggctttta tccatcattt attacaacat tgtcacacga aaaaggtaaa ggtgataaaa 180
gogagtttga aatcacttac ggcagaaaca tggatgctac atatgcatac gtgacaagac 240
ctcgttttagc cgttgataga aaacatgatg cttttaaaaa ccgaaacgtt acagttaaatt 300
atgaagtga ctggaaaaca catgaagtaa aaattaaaag catcacacct 350

<210> 118
<211> 221
<212> DNA
<213> Staphylococcus aureus

<400> 118
tttaagcgta ctatcacaca gacaagatgg cgctaaaaaa tctaaaatta cagtaactta 60
tcaacgtgaa atggatttat accaaattcg ttggaatggc ttctactggg caggcgcgaa 120
ttataaaaac tttaaaacta gaacatttaa atcaacatat gaaattgatt gggaaaatca 180

caaagtgaaa ttgtagata caaaagaaac tgaaaacaat a 221

<210> 119
<211> 337
<212> DNA
<213> Staphylococcus aureus

<400> 119
ttgatagcga tttatttgta ggctacaaac ctcatagtaa agatcctaga gattatttcg 60
ttccagacag cgagttacca cctcttgtag aaagtggatt taacccttca tttatcgcaa 120
cagtatctca cgaaaaaggt tcaagcgaca cgagcgaatt tgaaatcact tatggaagaa 180
atatggatgt cactcatgcc attaaaagat caacacatta tggcaacagt tatttagatg 240
gtcatagagt ccataatgca tttaaaaata gaaactacac tgtgaaatat gaagtcaatt 300
ggaagactca cgaaatcaaa gtgaaaggac agaattg 337

<210> 120
<211> 752
<212> DNA
<213> Staphylococcus aureus

<400> 120
gtcagctcag taacaacaac actattgcta ggttccatat tgatgaatcc tgtecgctggt 60
gccgcagatt ctgatattaa tattaaaacc ggtactacag atattggaag caatactaca 120
gtaaaaacag gtgatttagt cacttatgat aaagaaaatg gcatgcacaa aaaagtatgt 180
tatagtttta tcgatgataa aaatcacaat aaaaaactgc tagttattag aacgaaaggt 240
accattgctg gtcaatatag agtttatagc gaagaagggtg ctaacaaaag tggtttagcc 300
tggccttcag cctttaaggt acagttgcaa ctacctgata atgaagtagc tcaaatatct 360
gattactatc caagaaattc gattgatata aaagagtata tgagtacttt aacttatgga 420
ttcaacggta atgttactgg tgatgatata ggaaaaattg gcggccttat tggtgcaaat 480
gtttcgattg gtcatacact gaaatatgtt caacctgatt tcaaaacaat tttagagagc 540
ccaactgata aaaaagtagg ctggaaagtg atatttaaca atatggtgaa tcaaaattgg 600
ggaccatatg atagagattc ttggaacccg gtatatggca atcaactttt catgaaaact 660
agaaatgggt ctatgaaagc agcagataac ttccttgatc ctaacaaagc aagttctcta 720
ttatcttcag ggttttcacc agacttcgct ac 752

<210> 121
<211> 507
<212> DNA
<213> *Staphylococcus aureus*

<400> 121
tggtatcgac cgttttgtat ccaaattggg ggcaatataa acgcgctgat ttaatcggac 60
aatcttctta tattaataat aatgatgtcg taatattcaa tgaagcattt gataatggtg 120
cttcagacaa attattaagt aatgtgaaaa aagaatatcc ttaccaaaca cctgtactcg 180
gtcgttctca atcaggttgg gacaaaactg aaggtagcta ctcatcaact gttgctgaag 240
atggtggcgt agcgattgta agtaaataatc ctattaaaga gaaaatccag catgttttca 300
aaagcggttg tggattcgat aatgatagca acaaaggctt tgtttataca aaaatagaga 360
aaaatggtaa gaacgttcac gttatcggta cacatacaca atctgaagat tcacgttgtg 420
gtgctggaca tgcgcgaaaa attagagctg aacaaatgaa agaaatcagt gactttgtta 480
aaaagaaaaa tatcccaaaa gatgaaa 507

<210> 122
<211> 213
<212> DNA
<213> *Staphylococcus aureus*

<400> 122
ggtgtcctat ctcgaaaaca aaacgctgca aaaaaatcaa aaattactgt tacttatcaa 60
agtgaatgg atagatatat aaacttttgg atcaacttca actggatagg taataattat 120
aaagatcaca taagagcaac tcatacatca atttatgaag ttgattggga aaatcataca 180
gttaaattaa tagatactca atctaaggaa aaa 213

<210> 123
<211> 220
<212> DNA
<213> *Staphylococcus aureus*

<400> 123
ataaagaaag gaaatgattt tatggtcaaa aaaagactat tagctgcaac attgtcgtta 60
ggaataatca ctctatttgc tacttcgttt catgaatcta aagctgataa caatattgag 120
aatattggtg attgcgctga ggtagtcaaa agaacagaag atacaagttg cgataagtgg 180
ggggtcacac aaaatattca gtttgatttt gttaaagata 220

<210> 124

<211> 359
<212> DNA
<213> Staphylococcus aureus

<400> 124
atcattaggt aaaatgtctg gacatgatcc aaattttattt gttggatata aaccatatag 60
tcaaaatccg agagactatt ttgtgccaga caatgaatta cccccattag tacacagtgg 120
tttcaatcct tcattttattg caactgtttc tcatgaaaaa ggctcaggag atacaagtga 180
atttgaaata acgtatggca gaaatatgga tgttactcat gctactagaa gaacaacaca 240
ctatggcaat agttatttag aaggatctag aatacacaag gcatttgtaa acagaaatta 300
cacagttaaa tatgaagtga actggaaaac tcatgaaatt aaagtgaaag gacataatt 359

<210> 125
<211> 612
<212> DNA
<213> Staphylococcus aureus

<400> 125
aagttgctca aatacaagct ggtttacaat ataaaccaca agtacaacgt gtaccaggta 60
agtggacaga tgctaacttt aatgatgtta agcatgcaat ggatacgaag cgttttagctc 120
aagatccagc attaaaatat caattcttac gcttagacca accacaaaat atttctattg 180
ataaaattaa tcaattctta aaaggtaaag gtgtattaga aaaccaaggt gctgcattta 240
acaaagctgc tcaaatgtat ggcattaatg aagtttatct tatctcacat gccctattag 300
aaacaggtaa cgggtacttct caattagcga aagggtgcaga tgtagtgaac aacaaagttg 360
taactaactc aaacacgaaa taccataacg tatttggtat tgctgcatat gataacgata 420
ctttacgtga aggtattaaa tatgctaaac aagctgggtg ggacacagta tcaaaagcaa 480
tcgttggtgg tgctaaattc atcggcaact catatgtaaa agctgggtcaa aatacacttt 540
acaaaatgag atggaatcct gcacatccag gaacacacca atatgctaca gatgtagatt 600
gggctaacat ca 612

<210> 126
<211> 401
<212> DNA
<213> Staphylococcus aureus

<400> 126
tgttattatt ctcatTTTTt tcaattacta atgaggtaag tgcataaagt tcattcgaca 60
aaggaaaata taaaaagggc gatgacgcga gttattttga accaacaggc ccgtatttga 120

tggtaaatgt gactggagtt gatggtaaag gaaatgaatt gctatcccct cattatgtcg 180
agtttcctat taaacctggg actacactta caaaagaaaa aattgaatac tatgtcgaat 240
gggcattaga tgcgacagca tataaagagt ttagagtagt tgaattagat ccaagcgcaa 300
agatcgaagt cacttattat gataagaata agaaaaaaga agaaacgaag tctttcccta 360
taacagaaaa aggttttggt gtcccagatt tatcagagca t 401

<210> 127
<211> 715
<212> DNA
<213> Staphylococcus aureus

<400> 127
ttttattcat tgccctaacg ttgacaacaa gtccacttgt aaatggtagc gagaaaagcg 60
aagaaataaa tgaaaaagat ttgcgaaaaa agtctgaatt gcagggaaca gctttaggca 120
atcttaaaca aatctattat tacaatgaaa aagctaaaac tgaaaataaa gagagtcacg 180
atcaattttt acagcatact atattgttta aaggcttttt tacagatcat tcgtggtata 240
acgatttatt agtagatttt gattcaaagg atattgttga taaatataaa gggaaaaaag 300
tagacttgta tgggtgcttat tatgggtatc aatgtgcggg tggtagacca aacaaaacag 360
cttgtatgta tgggtggtgta acgttacatg ataataatcg attgaccgaa gagaaaaaag 420
tgccgatcaa tttatggcta gacggtaaac aaaatacagt acctttggaa acggttaaaa 480
cgaataagaa aaatgtaact gttcaggagt tggatcttca agcaagacgt tatttacagg 540
aaaaatataa tttatataac tctgatgttt ttgatgggaa gggtcagagg ggattaatcg 600
tgtttcatac ttctacagaa ccttcgggta attacgattt atttggtgct caaggacagt 660
attcaaatac actattaaga atatatagag ataataaaac gattaactct gaaaa 715

<210> 128
<211> 233
<212> DNA
<213> Staphylococcus aureus

<400> 128
cgtagatgtg tttggagcta attattatta tcaatgttat ttttctaaaa aaacgaatga 60
tattaattcg catcaaactg acaaacgaaa aacttgtatg tatggtggtg taactgagca 120
taatggaaac caattagata aatatagaag tattactggt cgggtatttg aagatggtaa 180
aaatttatta tcttttgacg tacaaactaa taagaaaaag gtgactgctc aag 233

<210> 129
<211> 360
<212> DNA
<213> *Staphylococcus aureus*

<400> 129
aattttttggc acatgattta atttataaca ttagtgataa aaaactgaaa aattatgaca 60
aagtgaaaac agagttatta aatgaagggt tagcaaagaa gtacaaagat gaagtagttg 120
atgtgtatgg atcaaattac tatgtaaact gctatttttc atccaaagat aatgtaggta 180
aagttacagg tggcaaaact tgtatgtatg gaggaataac aaaacatgaa ggaaaccact 240
ttgataatgg gaacttacia aatgtactta taagagttta tgaaaataaa agaaacacia 300
tttcttttga agtgcaaaact gataagaaaa gtgtaacagc tcaagaacta gacataaaag 360

<210> 130
<211> 501
<212> DNA
<213> *Staphylococcus aureus*

<400> 130
ccacctgttg aaggaagagg agttattaat tctagacagt ttttatctca tgatttaatt 60
tttccaattg agtataagag ttataatgag gttaaaactg aattagaaaa tacagaatta 120
gctaacaatt ataaagataa aaaagtagac atttttggcg ttccatattt ttatacatgt 180
ataataccta aatctgaacc ggatataaac caaaattttg gaggttggtg tatgtatggt 240
ggtcttacat ttaatagttc agaaaatgaa agagataaat taattactgt acaggtaaca 300
atcgacaata gacaatcact tggatttaca ataactacia ataagaatat gggtactatt 360
caggaactag attacaaagc aagacactgg ctactaaaag aaaaaaagct atacgagttt 420
gatggttctg catttgaatc tggatatata aaatttactg aaaagaacia tacaagtttt 480
tggtttgact tatttcctaa a 501

<210> 131
<211> 542
<212> DNA
<213> *Staphylococcus aureus*

<400> 131
gaagatttac acgataaaag tgagttaaca gatttagctt tagctaagtc atatggtcaa 60
tataatcacc cattcattaa agaaaatatt aagagtgatg aaataagtgg agaaaaagat 120

ttaatatatta gaaatcaagg tgatagtggc aatgatttga gagtaaagtt tgcaactgct 180
gatttagctc agaagtttaa aaataaaaaat gtagatatat atggggcatc tttttattat 240
aagtgtgaaa aaataagtga aaatatctct gaatgtctat atggagggtac aacactaaat 300
agtgaaaaat tggcacagga aagggtgatt ggtgctaata tttgggtaga tggatttcaa 360
aaagaaacag aattaatacg aacaaataag aaaaatgtga cattgcaaga attagatata 420
aagatcagaa aaatatgtgc cgataaatat aaaatttatt ataaagacag cgaaataagt 480
aaaggtctaa ttgaatttga tatgaaaact cctagagatt actcattcga catttatgat 540
tt 542

<210> 132
<211> 343
<212> DNA
<213> Staphylococcus aureus

<400> 132
agtcttatct aacggcgatg taggtccagg aaatctaaga aattttttata ctaaatatga 60
atatgtgaat ttaaagaatg ttaaagacaa aaattcacca gaatcacacc gcttagaata 120
ctcgtataaa aatgatacat tgtatgctga atttgacaat gaatatataa ctagtgatct 180
aaagggaaaa aatgtcgatg tttttggtat aagctataaa tatgggttcta actctcgtac 240
tatatatggt ggtgttacta aagcagaaaa caataaatta gattcgccaa gaataatacc 300
tataaattta attatcaatg gcaagcatca aacagttaca act 343

<210> 133
<211> 272
<212> DNA
<213> Staphylococcus aureus

<400> 133
ggatataaat acggaaataa agttacattt atagataatt ctcaacaaat tgatgttaca 60
ttgacaggaa atgaaaaatt aactgttaaa gatgatgacg aagttttctaa tgttgacgtg 120
tttgtagtaa gagaaggtag tgacaaatca gctatcacia catcgattgg tggaattaca 180
aagacaaatg ggactcaaca taaagatact gttcaaaacg ttaatttgtc agttttctaag 240
agtacaggtc aacacactac ttctgtgact tc 272

<210> 134
<211> 450
<212> DNA

<213> Staphylococcus aureus

<400> 134

atgaaattta aagcgatagc aaaagcaagt ttagcattgg gaatgttagc aacaggtgta	60
attacatcga atgtacaatc agtacaagcg aaaacagaag ttaaacaaca aagtgaatca	120
gagttgaaac actattataa taaaccgggt ttagagcgta aaaatgttac tggatataaa	180
tatactgaaa aaggtaaaga ttatatagat gttatagtag acaatcaata ttctcaaatt	240
tcttttagttg gatctgataa agacaaatth aaagatggag acaactcgaa tatagatgtg	300
tttatcctta gagaaggtga cagtagacaa gcaacaaatt actcaattgg tggcgtaaca	360
aaaacaaaca gtcaaccttt tattgactat atacacacac caatccttga aatcaagaaa	420
ggtaaagaag aaccacaaag tagttttatac	450

<210> 135

<211> 500

<212> DNA

<213> Staphylococcus aureus

<400> 135

gtattgaata taaaaatgtg acagggttata tcagtttcat tcaaccaagt attaaattta	60
tgaatatcat agatggtaat tctgttaata accttgcttt aattggcaaa gataagcaac	120
attatcatalc ggggtgtacat cgtaatctta atatatttta cgtaatgag gataagagat	180
ttgaaggtgc aaagtactct attgggggta tcaactagtgc aaacgataaa gctgtcgacc	240
taatagcaga agcaagagtt attaaagcag atcatattgg tgaatatgat tatgactttt	300
tccattttaa aatagttaaa gaagcgatgt cattgaaaga gattgatttt aaattaagaa	360
aataccttat tgataattat ggtctttacg gtgaaatgag tacagggaaa attaccgtca	420
aaaagaaata ctatggaaag tatacatttg aattggataa aaagttacaa gaagaccgta	480
tgtccgatgt tatcaatgtc	500

<210> 136

<211> 384

<212> DNA

<213> Staphylococcus aureus

<400> 136

gcgcaattac agtaacgacg caatcgggtca aagcagaaaa aatacaatca actaaagttg	60
acaaagtacc aacgcttaaa gcagagcgat tagcaatgat aaacataaca gcaggtgcaa	120
attcagcgac aacacaagca gctaacacaa gacaagaacg cagcctaaa ctcgaaaagg	180

caccaaatac taatgaggaa aaaacctcag cttccaaaat agaaaaata tcacaaccta 240
aacaagaaga gcagaaatcg cttaatatat cagcaacgcc agcgccctaaa caagaacaat 300
caciaacgac aaccgaatcc acaacgccga aaactaaagt gacaacacct ccatcaacaa 360
acacgccaca accaatgcaa tcta 384

<210> 137
<211> 270
<212> DNA
<213> Staphylococcus aureus

<400> 137
tttaaaagtt agttctttat tcgttgcaac ttgacaaca gcgacacttg tgagttctcc 60
agcagcaaac gcgttatctt caaaggctat ggacaatcat ccacaacaaa cgcagtcaag 120
caaacagcaa acacctaaga ttcaaaaagg cggtaacctt aaaccattag aacaacgtga 180
acacgcaaat gttatattac caaataacga tcgtcaccaa atcacagata caacgaatgg 240
tcattatgca cccgtaactt atattcaagt 270

<210> 138
<211> 556
<212> DNA
<213> Staphylococcus aureus

<400> 138
tttttatcgt aagccctttg ttgcttgcca caatcgctac agattttacc cctgttcctt 60
tatcatctaa tcaaataatc aaaactgcaa aagcatctac aaacgataat ataaaggatt 120
tgctagactg gtatagtagt gggctctgaca cttttacaaa tagtgaagtt ttagataatt 180
ccttaggatac tatgcgtata aaaaacacag atggcagcat cagccttata atttttccga 240
gtccttatta tagccctgct ttacaaaag gggaaaaagt tgacttaaac acaaaaagaa 300
ctaaaaaaag ccaacatact agcgaaggaa cttatatcca ttccaaaata agtggcggtta 360
caaatactga aaaattacct actccaatag aactaccttt aaaagttaag gttcatggta 420
aagatagccc cttaaagtat tggccaaagt tcgataaaaa acaattagct atatcaactt 480
tagactttga aattcgtcat cagctaactc aaatacatgg attatatcgt tcaagcgata 540
aaacgggtgg ttattg 556

<210> 139
<211> 532

<212> DNA

<213> *Staphylococcus aureus*

<400> 139

```
gaaagtattc tgtaggtact gcttcaattt tagtagggac aacattgatt tttgggttaa      60
gtggatcatga agctaaagcg gcagaacata cgaatggaga attaaatcaa tcaaaaaatg    120
aaacgacagc cccaagtgag aataaaacaa ctaaaaaagt tgatagtcgt caactaaaag    180
acaatacgca aactgcaact gcagatcagc ctaaagtgac aatgagtgat agtgcaacag    240
ttaaagaaac tagtagtaac atgcaatcac cacaaaacgc tacagctaata caatctacta    300
caaaaactag caatgtaaca acaaatgata aatcatcaac tacatatagt aatgaaactg    360
ataaaagtaa tttaacacaa gcaaaagatg tttcaactac acctaaaaca acgactatta    420
aaccaagaac tttaaatacg atggcagtgga atactgttgc agctccacaa caaggaacaa    480
atgttaatga taaagtacat ttttcaaata ttgacattgc gattgataaa gg            532
```

<210> 140

<211> 622

<212> DNA

<213> *Staphylococcus aureus*

<400> 140

```
cgggcaaata aataaagatg taacagatat aaaaatatat caagttccta aagggttatac      60
attaaataaaa ggatacgatg tgaatactaa agagcttaca gatgtaacaa atcaatactt    120
gcagaaaatt acatatggcg acaacaatag cgctgttatt gatTTTggaa atgcagattc    180
tgcttatgtt gtaatggta atacaaaatt ccaatatata aatagcgaaa gcccaacact    240
tgttcaaata gctactttat cttcaacagg taataaatcc gtttctactg gcaatgcttt    300
aggatttact aataaccaa gtggcggagc tggtaagaa gtatatataaa ttggtaacta    360
cgtatgggaa gatactaata aaaacggtgt tcaagaatta ggagaaaaag gcgttggcaa    420
tgtaactgta actgtatttg ataataatac aaatacaaaa gtaggagaag cagttactaa    480
agaagatggg tcatacttga ttccaaactt acctaatgga gattaccgtg tagaattttc    540
aaacttacca aaagggttatg aagtaacccc ttcaaaacaa ggtaataacg aagaattaga    600
ttcaaacggc ttatcttcag tt            622
```

<210> 141

<211> 892

<212> DNA

<213> *Staphylococcus aureus*

<400> 141
aaagttggcg atggttaaaga taatgtggca gcagcgcgcatg acggttaaaga tattgaatat 60
gatacagagt ttacaattga caataaagtc aaaaaaggcg atacaatgac gattaattat 120
gataagaatg taattccttc ggatttaaca gataaaaatg atcctatcga tattactgat 180
ccatcaggag aggtcattgc taaaggaaca tttgataaag caactaagca aatcacatat 240
acatttacag actatgtaga taaatatgaa gatataaaat cacgcttaac tctatatctg 300
tatattgata aaaaaacagt tccaaatgag acaagtttga atttaacatt tgctacagca 360
ggtaaagaaa caagccaaaa tgtcactgtt gattatcaag atccaatggc ccatgggtgat 420
tcaaacattc aatctatctt tacaaaatta gatgaagata agcaaactat tgaacaacaa 480
atztatgtta acccattgaa aaaatcagca accaactacta aagttgatat agctggtagt 540
caagtagatg attatggaaa tattaaacta ggaaatggta gcaccattat tgacccaaat 600
acagaaataa aggtttataa agttaactct gatcaacaat tgcctcaaag taatagaatc 660
tatgatttta gtcaatacga agatgtaaca agtcaatttg ataataaaaa atcatttagt 720
aataatgtag caacattgga ttttggtgat attaattcag cctatattat caaagttgtt 780
agtaaataa cacctacatc agatggcgaa ctagatattg cccaaggtag tagtatgaga 840
acaactgata aatatgggta ttataattat gcaggatatt caaacttcat cg 892

<210> 142
<211> 747
<212> DNA
<213> Escherichia coli

<400> 142
gtttgggact tattgctctg gcggtgggta atgcatatgc aacacaattg ttggatgatt 60
atagtataat ttcctatatg actgatgaag aatcgccgat tgaaatcaaa gataataatc 120
cgataagtaa tggagagtat ctaaccactg aagacgaaag ccatgctgtg aaagtggatg 180
acggtgtaac tggatatata aataatgcca gtgtgatgac tagtgggtgat ggatcttatg 240
gtatttctgt tgatagtcaa aacaaagtat tatatataag cgatagcgat attaagacct 300
ctggaagcgt atctgacaaa gaaaatggag ggataacagc cagcgcagta gtcagtgaat 360
ttggtggcac catctttatg aatggtgata attcagtcga gtcgggtggg gcatattcag 420
cgggactttt aagccagggt aatgattctg aaaagatggg aaataacacc cgtcttgaaa 480
ccacagataa aacgaacatt gttacctctg gggaaaatgc agtaggtgtt cttgcatgtt 540

caagtcctgg agagtctcga acatgtgtcg atgctgtaga tgatgaagtt agtgattcta 600
acagttacga agttattagc cgtgctgatt taaaaatgaa tgggtggttcc ataacaacta 660
atggcattaa tagctatggg gcttatgcta atgggaaaaa agcatatatt aatttagatt 720
atgtggcact tgaaactgtg gctgatg 747

<210> 143
<211> 621
<212> DNA
<213> Escherichia coli

<400> 143
agcctggtga cgacttatct ggtggtgctg aacttcgcga ttttgccgag cctccagcag 60
tttaataaag tcctcgcgta cgaagtgcgt atgttgatga ccgacaaact gcaactggag 120
gacggcacgc agttggttgt gcctcccgtt ttccgtcggg agatctaccg tgagctgggg 180
atctctctct actccaacga ggctgccgaa gaggcaggtc tgcgttgggc gcaacactat 240
gaattcttaa gccatcagat ggccgagcaa ctgggcggcc cgacggaagt gcgcgttgag 300
gtcaacaaaa gttcgcctgt cgtctggctg aaaacctggc tgtcgcccac tatctgggta 360
cgcgtgccgc tgaccgaaat tcatcagggc gatttctctc cgctgttccg ctatacgtg 420
gcgattatgc tattggcgat aggcggggcg tggtgtttaa ttcgtatcca gaaccgaccg 480
ttggtcgatc tcgaacacgc agccttgagc gttggtaaag ggattattcc gccgccgctg 540
cgtgagtatg gcgcttcgga ggtgcgttcc gttaccctg cctttaacca tatggcggct 600
ggtgttaagc aactggcgga t 621

<210> 144
<211> 449
<212> DNA
<213> Escherichia coli

<400> 144
accacgacag gtcttttatga tctgaaaacc gaaaatacct tgtaactac cgatgctgca 60
ttcgataaat tagggaatgg cgataaagtc accgttggcg gcgtagatta tacttacaac 120
gctaaatctg gtgattttac taccaccaa tctactgctg gtacgggtgt agacgccgcg 180
gcgcaggcta ctgattcagc taaaaaacgt gatgcgttag ctgccaccct tcatgctgat 240
gtgggtaaata ctgttaatgg ttcttacacc aaaaagatg gtactgtttc tttcgaaacg 300
gattcagcag gtaatatcac catcgggtga agccaggcat acgtagacga tgcaggcaac 360

ttgacgacta acaacgctgg tagcgagcgt aaagctgata tgaaagcgct gcttaaagcc 420
gcgagcgaag gtagtgacgg tgcctctct 449

<210> 145
<211> 704
<212> DNA
<213> Escherichia coli

<400> 145
atggaattgc gtctgttcaa ctatctggtc gagcgtaaag atctgattca gatccccggtg 60
tatccgttcg aacgcgaatg gacgcacttc accagcatga cttacattga tgagttttca 120
gagctgcatg gcaaagatgt tccgggtgcgt gaagccctcg ccggacaagt gcccagcgca 180
ggcgtcggca cctgttttcag ccgccgcgcc gtgaccgcac tgttagctga cggtgacggg 240
attgcttttcg acgtgcagag tcttactgaa gattacgaca ttggcttccg cctgaaagaa 300
aaaggatatga cggaaatttt tgtccgtttt ccggtggtgg acgaagccaa agaacgcgag 360
cagcgtaa at ttttacagca cgcgcggaca tcaa acatga tctgcgtgcg cgaatatttc 420
cccgatacct tttcgactgc ggttcgacaa aaatcccgtt ggatcatcgg cattgttttc 480
caaggcttta aaaccataa atggacctcc agcctgaagc tgaactactt tctctggcgc 540
gaccgcaaag gggcaatcag taactttgtc agcttcctcg cgatgctggg gatgatccag 600
cttttgctgt tgctggcgta tgaaagtttg tggcccgatg cctggcattt cctttctatt 660
ttcagcggca gcgcatggtt aatgaccctg ctgtggctaa actt 704

<210> 146
<211> 251
<212> DNA
<213> Escherichia coli

<400> 146
ataatcctcg tcatttgcag attatggaac tcgagggggc gcagctcccg cgcgtactgg 60
atgateccaa agttgatgta gcgattatca gcaccactta cattcagcag accgggcttt 120
ctccggtgca cgacagcgta tttattgaag ataagaattc gccgtatgtg aatatttttg 180
tggcacggga agataataag aatgcagaaa acgtgaagga atttctgcaa tcttatcaat 240
caccggaagt c 251

<210> 147
<211> 423

<212> DNA

<213> Escherichia coli

<400> 147

```
ctctgtccct cagttctacg acggctctgg ccgctgccac gacggttaat ggtgggaccg      60
ttcactttaa aggggaagtt gttaacgccg cttgcgcagt tgatgcaggc tctgttgatc      120
aaaccgttca gttaggacag gttcgtaccg catcgtggc acaggaagga gcaaccagtt      180
ctgctgtcgg ttttaacatt cagctgaatg attgcgatac caatgttgca tctaaagccg      240
ctggtgcctt tttaggtacg gcgattgatg cgggtcatac caacgttctg gctctgcaga      300
gttcagctgc gggtagcgca acaaacgttg gtgtgcagat cctggacaga acgggtgctg      360
cgctgacgct ggatgggtgcg acatttagtt cagaaacaac cctgaataac ggaaccaata      420
cca                                                                 423
```

<210> 148

<211> 768

<212> DNA

<213> Escherichia coli

<400> 148

```
gactcggtag agcgattgcg gcaactggcg caacaaaccg gctcgtgaa gtcatacaacc      60
gaacagaaaag ttattaccac aacgaagaaa gctgtaccgg taaaacagac agtcacggca      120
cccgtcatac catccaatac agttttaact gccaaccccg tcattacaga gccggcaaca      180
accgtcattt ccattgagcc cgccaatcct gatgtggtct atatteccaa ctacaacca      240
accgtgggtt acgggaactg ggccaatact gcgtatccgc cggtttatct gccaccacca      300
gccggagAAC cgtttggtga cagctttgta cgcggttcg gctatagcat gggcggtgct      360
accacgtacg cactattcag cagcatcgac tgggacgacg acgatcatga ccatcatcat      420
catgacaatg atgattatca tcaccacgat ggcggtcata gtgacggtaa tggctggcaa      480
cacaacggcg acaacatcaa tatcgacgtc aacaatttca accgtatcac cggtgagcat      540
cttactgata agaatatggc atggcgggc aatccaaact accgtaatgg tgtgccctat      600
catgatcagg atatggcaaa gcggtttcat caaacgatg tcaacggcgg aatgagcgcc      660
acgcaattac ctgccccaac gcgcgacagc cagcgtcagg cggcagcaaa tcagtttcag      720
caacgaacac acgccgcacc agtcattaca cgagataccc aacgtcag                                                                 768
```

<210> 149

<211> 788

<212> DNA

<213> Escherichia coli

<400> 149

ctttacgacg gttctcccca ggactgaaag cccagtttgc cttcggcatg gtctttttgt	60
tcgttcagcc cgatgccagc gctgctgaca taagtgcgca gcaaataagg ggggtgatta	120
ttccgcaggc cttcagtcag gcgcttcagg acggcatgag cgtcccgcctc tatattcatc	180
tcgccggtag ccaggggtcg caggacgac agcgaatcgg cagcgctttt atctggctgg	240
acgatggaca gctacgcac cggaataac agctggaaga gagtgaagat aacgccagt	300
tcagcgaaca aactcgacag cagctgatgg ctctggccaa cgccccgttc aatgaggccc	360
ttaccatccc cctgactgac aacgcgcagc tggatctcag cttgcgcaa ctgctgctgc	420
agctagtggc caagcgcgaa gcgctgggca ccgtactacg ctacgtagc gaagacatcg	480
ggcagtcacg tgttaacacc ctcagcagta atctgagcta taacttgggc gtctataaca	540
accagttgcg taacggcggg agcaacacat ccagctatct gtcgctgaat aacgttactg	600
cactgcgcga acatcatgtg gtgctcgacg gctcgtgta cgggatcggg agcggcgaac	660
aggacagtga attatataaa gcgatgtatg aacgcgattt tgccgggtcac cgatttgccg	720
gtggaatgct cgacacctgg aacttgacgt ccttagggcc gatgaccgcc atttcagcag	780
ggaagatt	788

<210> 150

<211> 750

<212> DNA

<213> Escherichia coli

<400> 150

ttgaaacttc ttactgccgc atttttagca gcgagtcccg cggcgaagag tgctgttaat	60
aacgcctatg atgcattgat tattgaagct cgcaagggtg atactcagcc agctttgtca	120
tggtttgcac taaaatcagc actcagcaat aaccaaattg ctgactgggt acagattgcc	180
ttatggggccg ggcaagataa acaggttatt accgtttaca accgctaccg tcatcagcaa	240
ttaccagcgc gtggttatgc agctgtcgcc gtcgcttacc gtaacctgca acaatggcaa	300
aactcgctta cactgtggca aaaggcgcct tctctggagc cgcaaaataa ggattatcaa	360
cggggacaaa ttttaaccct ggcagatgct ggtcactatg atactgcgct ggttaaactt	420
aagcagctta actctggagc accggacaaa gccaatctac tcgcagaagc ctatatctat	480
aaactggcgg ggcgtcatca ggatgaatta cgggcgatga cagagtcatt acctgaaaat	540

gcattctacgc aacaatatcc cacagaatac gtgcaggcat tacgtaataa tcaacttgct 600
gccgcgattg acgatgccaa tttaacgcc a gatattcgcg ctgatattca tgccgaactg 660
gtcagactgt cgtttatgcc tacgcgcagt gaaagtgaac gttatgccat tgccgatcgc 720
gccctcgccc aatacgctgc attagaaatt 750

<210> 151
<211> 733
<212> DNA
<213> Escherichia coli

<400> 151
atagcagggc tgtttgatc atctctaagt tatgcagaaa acacggagat cccttcttat 60
gaagaaggga tctcgctctt tgatgttgaa gccactctgc aaccagatgg ggtgctcgac 120
atcaaagaaa atattcattt tcaggcgcga aatcagcaga ttaagcacgg cttttatcgt 180
gatttaccac gactatggat gcagcctgat ggggacgctg cactgctgaa ctatcatatt 240
gttggcgtca cccgtgatgg tattcctgaa ccctggcatc ttgactggca tatcgggtta 300
atgagtattg tcgtgggcga taaacaacgt ttcttgctc aaggcgacta tcattatcaa 360
attcattatc aggttaaaaa tgctttcctg cgtgaggggg attctgatct gctaactctgg 420
aacgtgaccg gtaaccactg gccgtttgaa atttataaga cccgtttttc tctccagttc 480
tctaataattg cgggtaatcc atttagcgaa atcgatcttt ttaccggaga agagggcgac 540
acatatcgta atggccgcat ccttgaggac ggaagaattg aatcccgcga tccgttttat 600
cgtgaagatt tcacggctct ctaccgctgg cctcacgctt tacttagcaa tgcctcggct 660
ccgcaaacga cgaatatttt cagccatctt cttttaccct ccacgtcatc gttgttaatt 720
tggtttccgt gtc . 733

<210> 152
<211> 756
<212> DNA
<213> Escherichia coli

<400> 152
tattgtcatc ggcagagtc tcacgatgcg ggcgatatca gctttagcga tatctttcgt 60
ggcccggctt ccatctttgg cggcattgag tatcaaacgc cgtggaatcc cctgcgtctg 120
aaactcgaat acgatggaaa caattaccag aatgatttcg ctggcaaact gcctcaggca 180
agccatttca acgtcggcgc agtttatcgc gctgccagct gggcagatct caacctgagt 240

tatgaacgcg gtaacacggt gatgtttggc ttcacgttac ggaccaattt caacgatctg 300
cgccctgccc tgcgcgatac gccaaaaccg gcatatcaac ctgcgcctga atctgaagga 360
ttgcagtaca ccacggtagc aaaccaactt accgccctga agtataacgc gggctttgac 420
gcgccagaaa ttcagctacg cgataagaca ctgtatatgt ctggtcagca atacaaatac 480
cgtgactctc gtgaagcggc cgatcgtgcc aaccggattc tgggtgaataa cctgccgcaa 540
ggcgttgaga agattagcgt gacgcaaaag cgcgagcata tggcgatggc gactaccgaa 600
accgacgtag ccagcctgcg caaacagctg gcaggtacag cgcctgggtca atcagagcca 660
ctgcaacaac aacgtgttga agctgaagat ctttctgcct ttggtcgggg ctaccgtatt 720
cgtgaagatc gcttttagcta ctctttcaac ccaaca 756

<210> 153
<211> 735
<212> DNA
<213> Escherichia coli

<400> 153
gaataccaaa gcagatcgtc tcgctgaatt aaaaatccgt tcgccctcaa ttcaactgat 60
aaaatttggc gctattgggt tgaatgcaat tatcttttcc cccctgctga tagctgctga 120
tacaggaagt caatatggca ccaatattac tattaatgat ggtgacagaa ttacaggaga 180
taccgccgat ccacaggaa acctctatgg tgtaatgacc ccagcaggaa acacgcctgg 240
caatatcaac ctgggtaatg atgtcaccgt caatgtcaac gacgcctctg gatatgcaaa 300
aggaatcatt attcagggca aaaacagctc cctgacagct aaccgactca cagtagatgt 360
tgttggtcaa acctctgcca tcggcattaa cttaattggc gactataccc atgctgactt 420
aggcacaggc agcaccatta agagtaacga tgacggcatc attattgggc atagctcaac 480
actaacagcc actcaattca ccattgaaaa ctggaacggc ataggcctaa ccatcaatga 540
ctatggcacc agtgtcgatc ttggaagcgg aagtaaaatc acgaccgatg gaagtacagg 600
tgtttatatc ggtggtctca acggcaataa cgccaatggc gctgcgcgtt ttacggctac 660
agacctgaca atcgatgttc agggctacag cgccatgggg ataaacgtac agaaaaactc 720
tgttgtcgat ctggg 735

<210> 154
<211> 509
<212> DNA

<213> Escherichia coli

<400> 154

ctaactcatt gtggtggagc ccaaacatga ttactcatgg tttttatgcc cggacccggc	60
acaagcataa gctaaaaaaaa acatttatta tgcttagtgc tggtttagga ttgttttttt	120
atgttaatca gaattcattt gcaaattggtg aaaattattt taaattgggt tcggattcaa	180
aactgttaac tcataatagc tatcagaatc gcctttttta tacgttgaaa acaggtgaaa	240
ctgttgccga tctttctaaa tcgcaagata ttaatttata gacgatttgg tcgttgaata	300
agcatttata cagttctgaa agcgaaatga tgaaggccga gcctgggtcag cagatcattt	360
tgccactcaa aaaacttccc tttgaataca gtgccttacc acttttaggt tcggcacctc	420
ttgttgctgc aggtgggtgc gctgggcata caaataaact gactaaaatg tccccggacg	480
tgaccaaaaag caacatgacc gatgacaag	509

<210> 155

<211> 338

<212> DNA

<213> Escherichia coli

<400> 155

ggcgttacta tcctctctat gtgcacacgg agctcctcag tctattacag aactatgttc	60
ggaatatcac aacacacaaa tatatacgat aaatgacaag atactatcat atacggaatc	120
gatggcaggc aaaagagaaa tggttatcat tacatttaag agcggcgcaa catttcaggt	180
cgaagtcccg ggcagtcaac atatagactc ccaaaaaaaaa gccattgaaa ggatgaagga	240
cacattaaga atcacatata tgaccgagac caaaattgat aaattatgtg tatggaataa	300
taaaaccccc aattcaattg cggcaatcag tatggaaa	338

<210> 156

<211> 500

<212> DNA

<213> Escherichia coli

<400> 156

tttgttggtt ttggtacttc attcctgaaa atttctattg tactggggat attgaagaac	60
gcattaggca ttcaacaggt accaccaaac atggcgctaa catcagtgtc tttgatactg	120
acaatgttta ttatgtctcc gataatatta cagataaatg ataatatctc tcaggaacca	180
atcaattata ccgactctga tttttttcaa aaagttgatg agaaaatatt atcaccatat	240
cgcggtatct tagaaaaaaa tacagagaaa gacaatgtag agttttttga acgtgcagct	300

caaaaaaaaaat tgggtaatga aactatctta aaaaaagact ctctatztat actggtaccg 360
gctttcacga tggggcagct tgaagctgca ttcaagatag gttttttgct ctatttacct 420
tttattgcga tagatttgat catttccaat atcttattgg ccttgggtat gatgatggta 480
tcgccagtaa caatttcgat 500

<210> 157
<211> 503
<212> DNA
<213> Escherichia coli

<400> 157
ttacgcttcc gatcatagta gagaactata cattttcgga aaaattgcc tctggaatct 60
ttcagttgac aggaatagtg ctaaaagaaa taagtattgg ttttttcatt gggttatcat 120
ttactattct tttttgggca atagatgcgg ctgggcagat tattgatact ctaagagggt 180
caacaatatc ttcaattttt aaccgcgtcca taagtgattc atcttctatc actggcggtta 240
ttttgtacca atttatctct gtgatctttg ttattcatgg tgggatacaa agcattctgg 300
ataagctata ttatctctac gagatattac cattacaagc cgatattgca ttcaatcgtg 360
ctttaataga ttttttggtt tctctatggg attcatttat taaactgatg ttatcatttt 420
cagttcccat gattatcggg atattcttat gtgatatggg gtttgggttt ctttaacaaaa 480
cagcgctca actaaacgta ttc 503

<210> 158
<211> 617
<212> DNA
<213> Escherichia coli

<400> 158
aagtgaagag gtaatggctg cagtcagtc attaatctta ttttcatttt tttctttata 60
tggcatgagt ttttttggtg atatagttgg gttagttaat acgacaatag actcgctaaa 120
tagaccgttt ttgtatgcca ttcgagaaat attaggtgcg gtgttaaata tatttttatt 180
atatattttg ccaatttctt tgattgtctt tgttggaact gttacgactg gtgtatcaca 240
aataggattc atctttgcgg ttgaaaaaat aaaaccatcg gctcagaaga ttagtgtaaa 300
aaataacctg aaaaatattt tttctgtaaa gagcattttt gagctactta aatcagtatt 360
taagttagtg ataattgttc tcatttttta ttttatgggg cattcatatg caaatgagtt 420
tgctaatttc acaggactga acgcatatca agctcttgtc gttgttgctt tttttgtttt 480

tcttttatgg aaaggcgtgc tattcggata tctactcttt tcagtatttg atttctgggt 540
ccagaagcat gagggactga agaaaatgaa aatgagtaaa gatgaggtga aacgagaagc 600
caaggatact gatggtg 617

<210> 159
<211> 740
<212> DNA
<213> Escherichia coli

<400> 159
gatggtgact ctattgcagg attaccaaca aaaacaattg gcgcaaagct atcagattca 60
gcaggccggt tttgagagcc agaataaagc tattgaggaa aaaaaagccg cggcaaccgc 120
tgctttgggt ggcgggatta tttcatcagc attggggatc ttaggttctt ttgcagcaat 180
gaacaacgcg gctaaagggg ctggtgagat tgctgaaaaa gcaagctctg catcttcaaa 240
ggctgctggt gcggcttctg aggttgcaaa taaagctctg gtcaaggcta cggaaagtgt 300
tgctgatgtc gcagaggagg catccagtgc gatgcagaaa gcgatggcca caacaacgaa 360
agcagccagc cgtgcatctg gcgttgcaaa tgatgttgcg aaagccactg actttgctga 420
agatcttgca gacgccgccg agaagacaag cagaatcaat aagttggtga attccgtaga 480
taaactgacc aataccacag catttggtgc cgtgaccagt cttgctgaag gtacgaaaac 540
gttgccaaca acaatatctg agtccgtcaa atcgactcat gaggttaatg aacaacgtgc 600
gaagtcgctg gaaaacttcc agcaggggaa tctggagctg tataaacaag acgttcgcag 660
aacgcaggat gatatcacga ctcgctctgcg tgatataacg tccgctgtcc gcgatctcct 720
tgaggtccag aatcgtatgg 740

<210> 160
<211> 717
<212> DNA
<213> Escherichia coli

<400> 160
tgtttgaggt cactttcttg tggcgtgatc cccaagggtc tgaagaatac tcgacgataa 60
agcgcgtatg ggtctacatc actggtgtga ccgatcacca tcagaacagc cagccccagt 120
cgatgcagcg aattgcaggc actaacgtct ggacgtggac gacacaactc aatgccaaact 180
ggcgcggcag ctactgcttt attcccaccg aacgcgatga cattttttct gtaccatccc 240
ccgatcgccct cgaattgcgc gaaggctggc gaaaactatt accccaggcg atagccgatc 300

cgctgaacct acaaagctgg aaaggcgggc gagggcacgc tgtttctgca ctcgaaatgc 360
cgcaagcgcc tctgcaaccg ggatgggatt gtccgcaagc gccagaaata cctgccaaag 420
aaattatctg gaaaagtga cgggtgaaaa agtcacggcg tgtatggatt ttaccaccg 480
gcgatgcaac agcagaagaa cgcccgctgg cagttttgct cgatggcgaa ttttgggcgc 540
aaagtatgcc cgtctggcca gtgctgactt cgctgacca tcgtcagcaa cttcctcccg 600
ccgtgtatgt gttgatcgac gctatcgaca ccacgcaccg cgcccacgaa ctgccgtgta 660
atgcggattt ctggctcgca gtacagcaag agttattacc cctggtgaaa gctattg 717

<210> 161
<211> 379
<212> DNA
<213> Escherichia coli

<400> 161
tgtttctgca ctcgaaatgc cgcaagcgcc tctgcaaccg ggatgggatt gtccgcaagc 60
gccagaaata cctgccaaag aaattatctg gaaaagtga cgggtgaaaa agtcacggcg 120
tgtatggatt ttaccaccg gcgatgcaac agcagaagaa cgcccgctgg cagttttgct 180
cgatggcgaa ttttgggcgc aaagtatgcc cgtctggcca gtgctgactt cgctgacca 240
tcgtcagcaa cttcctcccg ccgtgtatgt gttgatcgac gctatcgaca ccacgcaccg 300
cgcccacgaa ctgccgtgta atgcggattt ctggctcgca gtacagcaag agttattacc 360
cctggtgaaa gctattgcc 379

<210> 162
<211> 402
<212> DNA
<213> Escherichia coli

<400> 162
tatgctgctc caactattcc tcaggggcag ggtaaagtaa cttttaacgg aactgttggt 60
actgctccat gcggcatttc tcagaaatca gctgatcagt ctattgattt tgggcagctt 120
tcaaaaagct tccttgcggc aggagtgta tccaaaccaa tgaatttaga tattgaattg 180
gttaattgtg atatcacttc atttaagggg gggggaggaa gccaggcagc aaaaaaaggg 240
actgtgaagc tggcttttag tggccaagg gtttctggtc ataatgagga gttagatacc 300
agcgggggga caggactgc aattgcagtt caggccgcag gtaaaaacgt ttctttcgat 360
ggcacagaag gtgatgctaa taccctgaaa gatggagata at 402

<210> 163
<211> 724
<212> DNA
<213> Escherichia coli

<400> 163
cttggaaatg ttggtaaagc tgtttcgcaa tatattctgg ctgagagaat ggcacagggg 60
ttatcgacaa cagctgcaag tgcgggtctg atcacatcgg ctgttatgct ggctatcagt 120
cctctttctt tcctggctgc tgcagataaa tttgagcgag ctaagcagct tgaatcatat 180
tctgaacgat ttaaaaaatt gaattatgaa ggggatgctt tactcgcagc ctttcataaa 240
gaaaccggag ctatagatgc agccctgaca acaataaata ctgtcctgag ttctgtatct 300
gcgggagtta gtgcagcctc cagtgcatec ctcatagggg ccccgataag catgctggtg 360
agtgcattaa ccggtacgat atctggcatt ctggaagcat caaacaggc tatgtttgag 420
cacgttgcaag agaaattcgc tgctcggatc aatgaatggg aaaaggagca tggcaaaaat 480
tattttgaga atggatatga cgcaagacat gctgcgtttt tagaagactc tctgtctttg 540
cttgctgatt tttctcgtca gcatgcagta gaaagagcag tcgcaataac ccagcaacat 600
tgggatgaga agatcgggtga acttgcaggc ataaccgta atgctgatcg cagtcagagt 660
ggtaaggcat atattaatta tctggaaaat ggagggcttt tagaggctca accgaaggag 720
ttta 724

<210> 164
<211> 618
<212> DNA
<213> Escherichia coli

<400> 164
tcaatgctga aactataagg catcagtata ataccacac acaagatttt ggggtgactg 60
aatggttact ggcagcgaaa tctattggct taaaagcaaa atatgtagaa aaacattttt 120
ccagattgtc aataatttct ttacctgcgt tgatatggcg ggatgacggt aagcattata 180
tattgtctcg tattactaaa gattcatcac gctatcttgt ttatgatcca gaacaacatc 240
agtcactaac ttttagtcgg gatgagtttg aaaaactgta tcagggaaaa gtcattctgg 300
ttacgtcaag agcaacagta gtcggagagt tagctaaatt tgatttttct tggtttatcc 360
cctctgttgt gaaatacagg aggattttac ttgaggtgtt aactgtttct gcttttattc 420
agtttcttgc gttaataaca cctctttttt ttcagggtgt aatggataag gttttagttc 480

accggggggtt ttcaacgtta aatattatca caatagcatt tattatagtg atactttttg 540
aagtgatatt aaccggagcc agaacttata ttttctctca tactacaagt cgtattgacg 600
tcgaactggg tgctaagt 618

<210> 165
<211> 768
<212> DNA
<213> Escherichia coli

<400> 165
catcaggcag ttatcctgtc gactttacca ctctctcccg gcttattatt gataagctcc 60
ggcatcaact ttttctgcca gttccctctc gcgaaacttt ccaccaacgc gtgctggaaa 120
gctacgcccc tacgcaacag acaattgatg cccgccatga ctggggccatc ctgctgaaa 180
aagcgttgaa ttttggcgag gctgagcagg cactgctgac aggacacgct ttccaccctg 240
cacctaagtc tcatgaaccg ttttaaccgcc aggaagctga acgatacctg cctgacatgg 300
cacctcactt cccgctgcgg tggtttctcg tggataaaac gcaaatacgt ggtgaaagtc 360
tgcactctaa ccttcaacag cggttgacgc gatttgccgc agaaaatgcg ccccagttac 420
tcaacgaatt aagtgacaat caatggctgt tcccgtgcg cccgtggcag ggagaatatc 480
ttttccagca agtgtggtgc caggcacttt ttgctaaagg acttatcaga gacttaggcg 540
aggccggcac gtcgtggctg ccgaccacct cttcccgtc cctctactgt gctaccagcc 600
gcgatatgat caagttctcc ctgagcgttc ggctgaccaa ctccgtccgt actctgtctg 660
tgaaagaggt ggagcgagga atgcgcctgg cacgtctggc gcaaaccgac ggctggcaga 720
tgctacaggc ccgcttccct actttccggg taatgcagga ggacgact 768

<210> 166
<211> 501
<212> DNA
<213> Escherichia coli

<400> 166
ttcacagcgg atatggactg cgctgtgaaa aactcgacaa gcctctgaat cttggctggg 60
ggctggacaa tagcgcggtg ttgcactggc ccggggagct gccaacaggg tggctgtgcg 120
acgcgctgga tcagatatatt atcgccgcac cacaactttc agcagtgggt cttccctggt 180
ccgaatggtg tgaggagcca caggcgctga cgcttttctg acaggtacaa agcgacatta 240
tccatcggtc cgctttctgg cagttaccgt tatggctgag ttctccggca aaccgggcct 300

ccggtgaaat ggtttttgat gcagagcgtg agatttatTT cccgcagcgc cccccccgTc 360
cgcagggtga agtttatcgt cgttacgac caccgattcg caggatgctg agtttccgca 420
ttgccgatcc cgtttctgat gcagaacgTt tcactcgctg gatgaacgat ccgcgcgTtg 480
agtatttctg ggagcaaagt g 501

<210> 167
<211> 721
<212> DNA
<213> Escherichia coli

<400> 167
agactgggat ttggtcaacc gccgcctggt ggcaaaaatg ttgtctgagc tggagtatga 60
gcaggttttc caccgcggaat ctcagggcga tgaccgctac tgcattaacc tgccgggagc 120
acaatggcgc ttcacgctg aacgtggtat ctggggctgg ctctggattg atgctcaaac 180
tctgcgctgc gcggacgagc cagtactggc tcagacgctg ctgatgcagc taaagcaggt 240
actgtcaatg agcgatgcaa ccgttgctga gcatatgcag gatttgtatg ccacgctgct 300
gggcgacctg caactactga aagcccgtcg cgggctgagc gccagtgacc tgattaatct 360
taatgccgac cgcttgcaat gcctgctgag cggtcacTct aaattcgTtt ttaataaagg 420
tcgccgtggc tggggtaaag aggcgctgga acgatatgcg ccagagtatg ccaacacctt 480
cagactgcac tggctggcgg taaaacgtga acatatgatc tggcgctgtg ataacgagat 540
ggatattcat cagttgttga cggccgcaat ggatccgcag gagtttgccc gcttcagtca 600
ggtctggcag gaaaacggac tggatcataa ctggctgccg ctgccggtac atccgtggca 660
gtggcaggaa aaaatcgcta ccgaattcat cgctgatttt ggccaaggca ggatggtgtc 720
t 721

<210> 168
<211> 719
<212> DNA
<213> Escherichia coli

<400> 168
ggagtatatt gcgtgggtag tattccccaa aaaggTtatg accaaaaatg gatatccctt 60
atttattgag gttcataata aaggtagctg gagtgaggag aatactggtg acaatgacag 120
ctatTTTTTT ctcaaggggt ataagtggga tgagcgggcc tttgatgcag gtaatttgtg 180
tcagaaacca ggagaaacaa cccgtctgac tgagaaattt gacgatatta tttttaaagt 240

cgccctacct gcagatcttc ctttagggga ttattctgtt acaattccat acacttccgg 300
catgcagcgt catttcgcga gttacttggg ggcccgtttt aaaatcccat acaatgtggc 360
caaaactctc ccaagagaga atgaaatgtt attcttattt aagaatatcg gcggatgccg 420
tccttctgca cagtctctgg aaataaagca tggatgatctg tctattaata gcgctaataa 480
tcattatgcg gctcagactc tttctgtgtc ttgcgatgtg cctgcaaata ttcgttttat 540
gctgttaaga aatacaactc cgacatacag ccatggtaag aaattttcgg ttggtctggg 600
gcatggctgg gactccattg tttcggttaa cgggggtggac acaggagaga caacgatgag 660
atggtacaaa gcaggtacac aaaacctgac catcggcagt cgctctatg gtgaatctt 719

<210> 169
<211> 561
<212> DNA
<213> Escherichia coli

<400> 169
aaatgaatgt ctggactcaa cgtggatttc atcaaaagga aactatatte agaagtttga 60
aaataaattt gcggaacaaa accatgtgca atatgcaact actgtaagta atggaacggt 120
tgctcttcat ttagctttgt tagcgtagg tatatcggaa ggagatgaag ttattgttcc 180
aacactgaca tatatagcat cagttaatgc tataaaatac acaggagcca ccccatcttt 240
cgttgattca gataatgaaa cttggcaaat gtctgttagt gacatagaac aaaaaatcac 300
taataaaact aaagctatta tgtgtgtcca tttatacggg catccatgtg atatggaaca 360
aattgtagaa ctggccaaaa gtagaaattt gtttgtaatt gaagattgcg ctgaagcctt 420
tggttctaaa tataaaggta aatatgtggg aacatttgga gatatttcta ctttttagctt 480
ttttggaaat aaaactatta ctacaggtga aggtggaatg gttgtcacga atgacaaaac 540
actttatgac cgttgtttac a 561

<210> 170
<211> 750
<212> DNA
<213> Escherichia coli

<400> 170
agcagcatca ggttctgagc tgcattgcga atcaaatgac aacggaagat attctggaga 60
aactgaaaat atcgctaaaa acgctctact gccataaaca caatatcatg atgacctca 120
atcttaagcg gatcaatgag ctggtacgcc atcagcatat taattatctg gtgtgaacga 180

ttgaacaata taaagaggcc cagcaacagc cagacctccc gttaattata cgttatgcag 240
taacgccttc cggatatcaac gaagcaatth gcttacgcc ttgcgcttgc tctgtttcac 300
cttctgtacg ttgaccataa agttgcgcta tctgcgtacc atcatgggca aacaattcca 360
gactgggttac gtgaccatcg ctggtcgggt tacgggtaac ccaggcttca gcaatgctct 420
cttctaatag atgaagggt aacgtcgggt tgaaaatatt cagccaacct ttcattggca 480
ccactttttc taccacaccg gtgaaaatct gtacgcagcc acggttgcca acaaacacca 540
tgatttcatt gccatcctgc tgtgcagatt caagaatttg cgccaacgca ctggttgata 600
ctttgcaggc caaatcgtct gccaccagat tgaacgcctg ttggcgcgtc aggttgtggc 660
gcttgagcaa cgtaaaaaac tgatgaacgt cggtcacgc ccgccactct tgctcgacca 720
cactggcatc ggctcgcgtt tgaacaactg 750

<210> 171
<211> 616
<212> DNA
<213> Escherichia coli

<400> 171
ttcttcggta tcctattccc gggagtttat gatagacttt tcgacccaac aaagttatgt 60
ctcttcgtta aatagtatac ggacagagat atcgaccctt ctgaaacata tatctcaggg 120
gaccacatcg gtgtctgtta ttaaccacac cccaccgggc agttatthtg ctgtggatat 180
acgagggctt gatgtctatc aggcgcgttt tgaccatctt cgtctgatta ttgagcaaaa 240
taatttatat gtggctgggt tcgttaatac ggcaacaaat actttctacc gtttttcaga 300
ttttacacat atatcagtgc ccggtgtgac aacggthtcc atgacaacgg acagcagtta 360
taccactctg caacgtgtcg cagcgtgga acgttcgga atgcaaatca gtcgtcactc 420
actggtttca tcatatctgg cgttaatgga gttcagtgggt aatacaatga ccagagatgc 480
atccagagca gttctgcgtt ttgtcactgt cacagcagaa gccttacgct tcaggcagat 540
acagggagaa ttctgtcagg cactgtctga aactgctcct gtgtatacga tgacaccgga 600
agaagtggac ctcaca 616

<210> 172
<211> 613
<212> DNA
<213> Escherichia coli

<400> 172
aaatggcgac aaattatacc gtgctgactc tagaccccca gatgaaataa aacgttccgg 60
aggtcttatg cccagagggc ataatgagta cttcgataga ggaactcaaa tgaatattaa 120
tctttatgat cacgcgagag gaacacaaac cggctttgtc agatatgatg acggatatgt 180
ttccacttct cttagtttga gaagtgtca cttagcagga cagtctatat tadcaggata 240
ttccacttac tatatatatg ttatagcgac agcaccaa atgtttaatg ttaatgatgt 300
attaggcgta tacagccctc acccatatga acaggagggt tctgcgtag gtggaatacc 360
atattctcag atatatggat ggtatcgtgt taattttggt gtgattgatg aacgattaca 420
tcgtaacagg gaatatagag accggtatta cagaaatctg aatatagctc cggcagagga 480
tggttacaga ttagcagggt tcccaccgga tcaccaagct tggagagaag aacctggat 540
tcatcatgca ccacaagggt gtggagattc atcaagaaca attacagggtg atacttgtaa 600
tgaggagacc cag 613

<210> 173
<211> 227
<212> DNA
<213> Escherichia coli

<400> 173
aagaagatgt ttatggcggg tttatttgca ttagtttctg ttaatgcaat ggcggcggat 60
tgcgctaaag gtaaaattga gttttccaag tataatgaga atgatacatt cacagtaaaa 120
gtggccggaa aagagtactg gaccagtcgc tggaatctgc aaccgttact gcaaagtgct 180
cagttgacag gaatgactgt cacaatcaaa tccagtacct gtgaatc 227

<210> 174
<211> 260
<212> DNA
<213> Staphylococcus epidermidis

<400> 174
ccactttttc tacttctaaa acttcagcaa gtgtttcacg taacttgcta gaacgagtaa 60
tttttatatc gtccttacca tcattttggt ctatggtaaa tatattcata ttattttctt 120
ctttaaatat tgctgcatgt actgtaaact tatcgtagtc aatcatagtt agtactgtat 180
ctaggtgcat aaatgtgcgt gtattaggta tttcaatagc tacgattttt ttaaaacttg 240
tgtttgcatc tttgaaaata 260

<210> 175
<211> 422
<212> DNA
<213> Staphylococcus epidermidis

<400> 175
ttgataacaa acaaattctg ctatttcatt tgaagaagtc aaaatcatca aagtatcgtt 60
acctccaata gttcctaata tttctttcat ttgtaattga tctatgtaat aacttatact 120
ttgagcaaag ccaggagatg tttttattaa gacatagtta tttagcgta taaattcaat 180
aatctcatca ctaaataattt ctaattgttt ttttgcactt aattgatttg tttgatttat 240
tttcttgtaa atatactttt tattttcaac agggattttg taaatttcta attcttgtaa 300
gtcacgagaa atagttgtca agctatagta aactccaaaa tgtcttgcca tgtaatccac 360
tatttgttgt tttttattaa actgattctg ttgtataaca gttaagataa gatttaaacg 420
tt 422

<210> 176
<211> 322
<212> DNA
<213> Staphylococcus epidermidis

<400> 176
taacactgaa cccaatgac ctacaatatg ttctaatact tgtgccattg atggattagc 60
aagttttgaa atttggttct gctgaatgac accttgggct agtacagtca ttaagaaata 120
aatgactagc acagaaatca aaccaataac ggtagcagtt cctacatcct ttttagactt 180
tgcacgtcca gaaaagacaa cggctccttc aatccctgtg aatacccata cagttactaa 240
catagtactt ttacttgtg ccattgtatc tccccaacta aaaacgccaa cacttccact 300
agtcatacca taaaaaccgg at 322

<210> 177
<211> 733
<212> DNA
<213> Staphylococcus epidermidis

<400> 177
cctcaaacaa gcagaaaaag ctaaaagcga agttacacaa tcaactacaa atgtatctgg 60
tacacaaaca tatcaagacc ctaccaagt tcaacctaaa caagacacac aaagtactac 120
atatgatgca tcattagatg aatgagtagc ttataatgaa atttcatcaa atcaaaagca 180
acaatcttta tcaacagatg atgcgaatca aatcaaacg aattctgtta caaaaaatca 240

acaagaagaa acaaatgatt tgacacaaga agataaaaca tccactgata caaatcaatt 300
acaggagaca caatctgtag caaaagaaaa tgagaaagat ttaggagcta acgcaaataa 360
tgaacaacaa gacaagaaga tgactgcaag tcaaccttcc gaaaatcaag caattgaaac 420
tcaaactgct tctaatagata atgaaagcca aaaaaaaagt cagcaagtaa cttctgaaca 480
aaatgaaact gctacaccta aagtatcaaa tacaaacgca tctgggttata attttgatta 540
cgatgatgaa gacgatgata gctcaacaga ccatttagag cctatctcat taaacaatgt 600
gaatgctaca tctaaacaaa ctacttcata taaatataaa gaaccagctc aacgtgtaac 660
aactaatact gtaaaaaaag aaacggcatc taatcaagcg actatagata caaagcaatt 720
caccccattht agt 733

<210> 178
<211> 507
<212> DNA
<213> Staphylococcus epidermidis

<400> 178
cttagggaaa aagatgggta gtaatgttaa agattctaaa attacaccga ataaaaataag 60
tttattttacc gggtcttttag ttactaatga aataactacg atagtacaat ataaaaatat 120
ggagagtatt ttttttcgct ttacaagacg tctaggtata gggtgtttct tagttgctgc 180
aggtgcgtat aaaatggtaa taattaatcc gactaatgcc atagataaaa gaacaaaata 240
gttaatatct aactttatta ttaagtatgg aaagataata aagaaaatta tgttctgaat 300
atgacataac aatgacgaat ttgcatgcgt accgtgtgca tgtctcctaa ttaaaaaata 360
acttaaataga gttaaaagtg tgtaaaagaa agtatgaaag attattgcta gcccatacac 420
aactatagac ttttcaatat ttatcgctag tacctgcac cctaaacgaa tttttagaaa 480
ctgtatgtga tctaagttat ttttacg 507

<210> 179
<211> 512
<212> DNA
<213> Staphylococcus epidermidis

<400> 179
cctcgcatat cagtttgtga caccatataa agtaaaataa atgatatgaa aagtactatt 60
gttattatca ataagtatct tttattgagt gacaagtagg atacttttaa tttattgaac 120
aatagttgag ttaaataagc aataattaga gttatgatta caaaagaggt aaaatgtatt 180

aactgtaaag caaatTTaaa cggaatataa tcttttatag tcaaatgtat gtatacagtt 240
atgaaattag ttatatataa gatcatagtg gtgaataata caactaatat tgaataaagc 300
tttatttttg tataaaagaa aatgggtgatt attataacca aaactattaa tgctttactt 360
tgccaaaagt aatacattat tgcagaaggg attacaatcg taaaaacgat tatgtaatcc 420
ctaaaattaa atttcatatt aatgataact ttagtaacct aaatcattaa aaagatttgt 480
aggcctgcaa acggaaatag attaatatca tc 512

<210> 180
<211> 534
<212> DNA
<213> Staphylococcus epidermidis

<400> 180
atgaagcaca accaccatac cttgtaaatt ttttttagat ttagttaaaa tggggataca 60
agatacatcg aaatatTTtag tatgtacgtt attaatagca acttctaatt gttcatagat 120
aactttttca gttctaaaac tttcaataat taatttttca atactatcat ctatgaaacc 180
aatgtaactt ttatttttcta ccatttgatc agggttaaac acctgataat aagcatgatt 240
agcaactaca atttctccat gtttatcaat catcagtact gaactcggta tatttttctaa 300
ggtagttttt aatctattgg attgaatttt ttgactattg ttttaattttt gcaatcgtcg 360
tgctaagtca tttgtagtca caaataatgc cctagtttcc ttcacattac tttctggaac 420
acgaacatgg taatatccat ctgctagaag tgatgtagca taagttactt cattgatagg 480
tctaatatat gttcgattga tactttctact tgctaaatag accgtaaata atac 534

<210> 181
<211> 286
<212> DNA
<213> Staphylococcus epidermidis

<400> 181
ctaagcaciaa gaaaggctca atattagcta tcataggttt gctaattgta tttgttggtta 60
caggttttat cttcttttca atgatttcag atcaaatttt tttcaaaccat gtcaaaccag 120
ttgaaaaggt tgaaaaatta gataaaactt tagataaagc atctaaaaag caaatacaca 180
attatacgag ccaacaagta tctaacaaag caaatacagc ttggcgtgat gcgtctggta 240
cagaaattaa agaagctatg gatagtagta aattcataga tgatga 286

<210> 182

<211> 381
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 182
acgacgaatg attcataagg tttaatatgg tctaaattta tatcatttaa gtgataatta 60
tgcaatttta tatctacaga tgaaatatct aattcaaaag gtaggttttag ttctgatact 120
tcatttgtga gattggctac aattaatata gtattgtttt taaatgtgcg tgtatatgca 180
aaaacctgct tattttcagc atcgaccata ttaaacttac cgtagatgta aatcaaataca 240
gatttttttta gttgaattaa cgctttataa taagaaagta tcgaaaactt atcatttagt 300
tgttgtttaa cattaatttc tgtatagtta gggtttacat gaaacatgg cttaccagta 360
gtgaatccag cattgataga a 381

<210> 183
<211> 272
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 183
ttaaaccatt aggaaatcgt gtgattattg agaagaaaga gcaagaacaa gcagctaaaa 60
gtggcatcgt tttaacagat agcgctaaag aaaaatcaaa tgaagggtgtg atcattgcag 120
ttggacaagg tcgtttatta gacaatggca cacaagttgc tcctcaagtc agtgaagggtg 180
acacaatcgt cttccaacaa tatgcaggta ctgaagtaaa acgtggcgcc caaacatatt 240
taattttaaa tgaagaagat atattagcta tt 272

<210> 184
<211> 614
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 184
tcaagacacg ctttctagtg ttttatctct agaatatcct gaaaaagaaa ttatcattat 60
caatgatgga agttctgata atactgctga aatcatctat gaattcaaga aaaatcatga 120
ttttaaattt gttgacctcg aagtcaatag aggtaaagct aatgcactca atgaggggaat 180
caaacaagca tcttacgaat atgttatgtg cttagatgct gacactgtca ttgatgacga 240
tgcgcctttt tatatgattg aagactttta aaagaatcca aaattaggcg cagttacagg 300
taatccacgt attcgtaata aaagttctat cttaggaaaa atacagacca ttgaatatgc 360
aagtattatt ggttgatatca agcgaagtca atctctagca ggagcaatca atactatttc 420

aggtgttttc acactattta aaaaaagtgc actcaaagat gtaggttatt gggatactga 480
catgattact gaggatatcg ctgtttcatg gaaactccat ctttttgatt acgaaattaa 540
gtacgaacca cgcgcacttt gctggatggt ggtgcctgaa actatagggtg gtttatggaa 600
acaaagggtt cgat 614

<210> 185
<211> 329
<212> DNA
<213> Staphylococcus epidermidis

<400> 185
gttttcttat tacgaaccac attgggttcta ccaattttca taatttaaatt ttactttcaa 60
aaaagcaatt agatgaaatg tatgaaacag gcttatggga ctttgaatct catactcatg 120
atttacacgc tcttaagaaa ggcaataaat cgaagttttt agattcgtct caatctgttg 180
ctagtaaaga tattaataaaa agcgaacact atttaaataa aaactaccca aaaaatgaac 240
gcgcacttgc ttacccatac ggattaatta atgacgacaa aataaaagct atgaaaaaaaa 300
atggaattca atatgggttt acacttcag 329

<210> 186
<211> 220
<212> DNA
<213> Staphylococcus epidermidis

<400> 186
ttattctgct atatgatatt cacgaatatt gttatcaata gatttttaaatt agaaaatgtc 60
acgatctgca tttgattttt caagttcatg attcaattct aattgggtcaa agcgtttgaa 120
gaaatgttca tattcatcaa cagaaacctc tattctatta ttttaataaag atttgtggcg 180
ctcaacatct aattgctcct tgaatccatc tactaatggt 220

<210> 187
<211> 210
<212> DNA
<213> Staphylococcus epidermidis

<400> 187
acattaagtc agcatttgga gaaaacatga ataaatgtct aaaccatata gcaatgggtt 60
gacgataatc aaattcaggt tgaatcgcat tggttacaag cgtagaataa caaccatta 120
ttaaaataat caacaaaacg atattcacia atatattctga aaatgaactt aatcgtctaa 180

cgtttttgat ggatagtcgt cttaaagtta 210

<210> 188
<211> 200
<212> DNA
<213> Staphylococcus epidermidis

<400> 188
attagagcca aagtactctc caccgtaacc ttgacttcct tgcgctttat aagtatctaa 60
atatgtttct ttatgggaag aaggcacaac aaaacgatct tcatatttag caatacctag 120
taagcgatac atttcagtca tctgtctttc agtaagtcct aatcgttcta atttagaagt 180
atcgaaaggt tggtttgta 200

<210> 189
<211> 284
<212> DNA
<213> Staphylococcus epidermidis

<400> 189
tttgatacct gtaatttggt cttgccaaagc gggagtatat ttagaagatg cgtcatacata 60
agatgtagct tctagttcgt gttcaaaacg ttgaacacca tattgactcg tcattaaatc 120
ataaacgta gcaattttta cttcttctcc gttagctaac tgaatagttc tcggttgcaat 180
aggtctctca aagataccat caccactgct atcaaaatat ggaaattgaa tcgtttcaac 240
atgatagtca ctttcaacca ttgataacat tggatcaatt ggtg 284

<210> 190
<211> 721
<212> DNA
<213> Staphylococcus epidermidis

<400> 190
agcttctcgc actacttgac taggatcatt agtgacctct attcctacca ttaaaccctac 60
accacgtact tcaattacat ttcttttatt tactaaactt tttcttaagt tttcaataag 120
aaattgcccc tttgattgaa catcattcag caaatcagca tcattaatga tagaaagcgt 180
ttggtttgca gcagccaatg ataatctatt tccaccgaat gttgtaccat gagaaccgta 240
gccaaatgca tgacctaaat tctttttgccc taacattgct ccaataggaa ggccattacc 300
taatccttta gctaattgtga tgatatctgg agacaattga taatgttcat gagcatataa 360
cttaccggtt ctacctatgc ccgtttgaac ctcgctctaca attataagga tatctttttg 420
tttacaatac tcattttaatt gcttcataaa taaaggatca gcaggtagta ctctgattc 480

accttgaatt atttctataa ttacagcagc agtattatth gaagttaatg atttaaata 540
attaaaatca ttaaaaatag caaatthgaa tccaggaaca accggacca attgatctgt 600
aatthtcttc tgtcctgttg cagacattgc gccgtacgtt ctgccgtgaa aagactthtt 660
aaaagcaata atttccgact taccagtagc thtacgtgcg agthtgatag ctgcctcatt 720
c 721

<210> 191
<211> 465
<212> DNA
<213> Staphylococcus epidermidis

<400> 191
aaagaaatta agtctctagc caaatgtat cttggtggta gtactgaaat taaaacatca 60
caacttaaag gtaaggatga ctacttaaat gatataact attaccaccc aagcgtaaaa 120
agtattatgg aatattcaaa tctthttacgt aatgattthg atttatctca aataacaaac 180
aaaaacgatt tcttagatca aagagtcatt aaacgatatg gttcactcgt acccttaaca 240
gaattagatg aagactthatt gcgtaagaac caaagggaat cgactgatag tcagaaagag 300
tctgattctt catcacaaaa taatgatgaa gaagatcaaa ctaacgaaca aacagacca 360
aatagcttaa acggaaacga acagtaccca aatcaacaag acaacaatca aaccaatggt 420
gaaatggta tgataaataa tgacaattat ccttacgcac aataa 465

<210> 192
<211> 362
<212> DNA
<213> Staphylococcus epidermidis

<400> 192
aaccaaacga tgctagatga ttgctthtgaa ataagaaagt gtgtthttcgt cgaagaacaa 60
ggcgtaccac tcgaaaatga atttgatcaa tatgaagatt actcattcca tatagtggga 120
tatataaatg gtgttcctat ggcaactgct agaattagac cthtaaatat tcatatttgt 180
aaaattgaac gtgtagcaat catcaagtgg tatcgtggtc ttgggtacgg taaaatttha 240
atacatgcta ttgaaacaat tgcaaaaaaa caccaatata atgaactcac tatgaatgct 300
caattacaag ctcgagactt thactthaaa ctaggttact cacctthttg taaagtattc 360
tt 362

<210> 193
<211> 320
<212> DNA
<213> Staphylococcus epidermidis

<400> 193
agttttataa tattcagtgc aaaattcaat tattgcgttt tgaagtggat aatagtattc 60
ggttgttaaa gatagttcat tatataaata aaatttttct ctattagttt tacatttgat 120
ttgttccttt ttccactggt cttgccattt agattcttct atatttaaaa tttctaaaaa 180
tagattttct tttgttttaa agtgataata aagattccct ttactacttt ctgataattt 240
aacaatttct ccagtagtag tggcattata tccatttttt ataaataatt cctttgcgac 300
acctagtatt ttatctttca 320

<210> 194
<211> 503
<212> DNA
<213> Staphylococcus epidermidis

<400> 194
tttagagaga cagctagata atttgaaaac atttggcgta gagaaaatat ttacagagaa 60
acgatcgggg aaatcagtag aaaatagacc tgtattttcaa gaagcactta actttgtgag 120
aatgggcgat agatttgtgg tagaatcgat tgatcgctta ggtcgtaatt atgatgaagt 180
gattaacaca gttaattatt taaaagataa agaggttcaa ttgatgatta ctagcttacc 240
tatgatgaat gaagtcattg gcaatccatt attagataaa tttatgaaag acctaatcat 300
tcaaataatta gcaatggttt cagaacaaga acgaaatgaa agtaaacgta gacaagcaca 360
aggtattaaa gttgcgaaag aaaatgggtgt atataaagga cgccctctat tgtactcacc 420
taatgctaaa gatcctcaaa aacgcattat ttatcataga gttgtagaaa tgttagaaga 480
aggtcaagca attagtaaga ttg 503

<210> 195
<211> 320
<212> DNA
<213> Staphylococcus epidermidis

<400> 195
tgaaagaagg gatagttttg cactttacac aacgtgaaca agacaaattg atgatagttg 60
tagctgctga ggttgcacgt cgtagaaaag caagaggact taaacttaat catcctgaag 120
cacttgcttt aatcagtgat gaattattag aaggcgcgcg tgatggtaaa acggtagctg 180

aactcatgag ctatggaaaa acaatttttaa acgaggaaga tgtcatggat ggcgtagcta 240
acatgattac agaacttgaa attgaagcaa cttttccaga tggactaag ttaataacag 300
tccatcaccc aatcgtttaa 320

<210> 196
<211> 503
<212> DNA
<213> Staphylococcus epidermidis

<400> 196
atgcaaatta tggagatgaa gctactttcg gtggcggaaa atcaattcgt gatggtatgg 60
ctcaaatcc taatgtgaca agagatgata aaaatgtagc cgatttagtt ttaactaacg 120
cattaattat tgattatgac aagattgtta aagcagatat cggaattaaa aatggttata 180
tttttaagat cggtaaagct ggaaaccag atataatgga taacgttgac atcatcattg 240
gtgcaacaac tgatattatt gctgctgaag gtaaaattgt tactgccggc ggtatcgata 300
cacacgtgca cttcatcaat cctgaacaag ctgaagttgc acttgagagt ggtattacaa 360
cgcatatcgg tggaggaact ggtgcttctg aaggtgctaa agcgactact gtaacaccag 420
gaccttggca tattcatcgc atgttagaag cagcagaaga gatgcctatt aatgtaggat 480
ttactggtaa aggtcaagct gtc 503

<210> 197
<211> 452
<212> DNA
<213> Staphylococcus epidermidis

<400> 197
tgattataga agaaattcaa ggaaatattg ctaattttatc tcaagatgaa aagcaaaaac 60
atgtcgaaaa agtttatctt gaaaactcag atttggttaa acgtatacaa cgtgttaaaa 120
cagatcacgg taatgaaata gggatacgtc ttaaacaacc tattgaccta caatatggtg 180
atattttata tcaagacgat acaaacatga ttattgtcga tgtaatagc gaagacttat 240
tagttattaa acctagaaat ttaaaggaaa tgggagacat tgctcatcaa ctaggtaatc 300
gccatctgcc tgcccaattt acagaaactg aaatgcttat tcaatatgac tatcttggtg 360
aagatttatt aaaagagttg ggtatcccct actcacatga agacagaaag gtcaatcaag 420
catttcgaca tataggacat tcacatgatt ga 452

<210> 198

<211> 524
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 198
ttaacttatt cagatgggat agctatgaga attgtctacc acgcattaat taacaatgac 60
aaagataaaa ttttagatat taaccaaaaa ctcttcgtac aaaatctacc taaagaaacg 120
cgtattggcg ctaagcaaat gggtagacgc atggtaaaat tagctttaga tctttatgat 180
agtgaatgga ttcaatggta ttataatcaa atgaaaaaca ataaaattaa gcttcaccc 240
gctgtgtgct ttactatgct aggacatttt ttaggtgtag atgtggaatc catcattgat 300
tattatttat atcaaaatat ctctagcctt acccaaatg cagtaagagc gattccttta 360
ggacaaacag ctggacagca agtcgtaact gaaatgatag cccatattga gaagacacga 420
aatcacatac tagaattgga cgaaatcgat tttggtatga ctgctcccg cttggaactt 480
aatcaaatgg aacatgaaaa tgttcattgt cgaatcttta tttc 524

<210> 199
<211> 500
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 199
tcgtatatgg aatttgtagc agatcctatt attgcctatg aaaacgctaa atttttccaa 60
cataatacgt ttaatcttaa agaagatagt gctatgtttt acactgatat attgactcca 120
ggctattcat ctaatggcca agatttcacg tataattata tgcattctat taatgaaatt 180
tacattgaca atcaattagt tgttttcgat aacatgatgt taagtcctga taaaagcaga 240
cttgacggca ttgggtatat ggaaaattat acacacttag gatcagctta ttttattcat 300
ccagatgtaa accaaagttt catagacgat atttacgcgg cggttgctga ttttcaaaaa 360
caatacgact gtagaatagg tatctcacia ttacctactc atggattggc cgttcgtatt 420
ttgactaaaa gaactcaa atagaagaa attttgactc gtgttcaatc atatatcaat 480
caaacgattt atcatcgaca 500

<210> 200
<211> 363
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 200
gcttaacaac gtaaaacaag ctggcggtga tcaaattgta actattattg gtcattggcg 60

tgagagtgtg aaagatacat tgggtaatca atcattatat agttttcagg ataaacaact 120
tggaacagct catgctgtga aaatggcaca tgaacattta gcagataaag aaggaactac 180
tctagtagta tgtggagata caccacttat tacataccaa actttacaat cacttattga 240
acatcatgaa agtacacaat cacatgttac tgtattatct gcttctacta tcaatcetta 300
tggttatgga cgaattatta gaaatcataa tggaatatta gagcgtattg ttgaagagaa 360
aga 363

<210> 201
<211> 780
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 201
agctcacggc tttaactatg ctatttataa agatgtgggt ttagatttct gaaaactgga 60
atatattctc tttgttgatc tactaagtct acatcgatat gtgttgtag tactccttct 120
ttatcatcta aatgggtctaa aatttcacca ttaggattaa tgacaattga atttccagca 180
taattggtgt gaccatcatc accacaacta ttacaagcta caataaaaat atcattttcg 240
attgctctcg ctttttagtaa tgataaccaa tgatctagtc ttgagctagg ccaactgcgc 300
acataaaaag caatttttagc accttttcta gctggatagc gcaatatctc tggaaatcgc 360
aagtcataac aaatgatttg cgtcacaagt gtttgatcag ataaataaaa aggttcaggg 420
actacatttc caccacataa aaagtctggc tcacgtaaca ttggcacgag atgtactttg 480
tcatattcat taatcaattc tttgttttta ttaattgcaa aagcagtatt atatatatgg 540
ttttctctta tatttgacac tgaacctgca atgatatcta cattaaatgt atgtgctaag 600
tcttttataa agagagagct gtctttaaga tttttatcag ctttttggtc taattcttct 660
aatgcataac cgttattcca catttctgga agcacgacga cactggtatc tttatctaag 720
tattgattaa acttagtttt gatattttgc atatttttat caacatttcc acgttctaca 780

<210> 202
<211> 501
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 202
gtatttacgt gcgtttattt gtgtcataat catcgtgaca cacttactaa cgcaaatcac 60
tttagaaaat gaacagatgt ctgatagttc actcatattg caatattata tacgcaatat 120

ttttattttc ggcaccccta gttttataat attgtctcaa ttattaacaa cattaaatta 180
cgaatcagta actataaatt atcttttttc aagatttaag tatattttta ttccatatct 240
tttaatcggc ttgttctata gttatagtga atcacttatc accgcttctt cttttaaaaa 300
gcagttttatc gaaaatggtg ttttaggaca atgggatggc tatttcatta tcataattat 360
gcagttcttt gttctatctt atatcattta caaaattaat tttagattgt tcaatagtaa 420
aattttgctg ctttttagcat ttatagtcca acaatcttat ctacattatt ttttgaataa 480
tgacactttt catcaattca t 501

<210> 203
<211> 300
<212> DNA
<213> Staphylococcus epidermidis

<400> 203
ggtcaagccc agacagaggc aatatccaac ggtaacctct tatttaaata tagttaggga 60
gagcttattt attactatat ccggagtatt ttggatgtat tgtatcggtg tgatgattgt 120
ttatatagga actcttatca attctcaa at ggaaagtgtt ataacaatac gtattgcatt 180
aaatgttgaa aacacggaaa tttacaaatt attcggatgg atgagtttgt ttgtacttat 240
tatattttatc ttttttacat ttagtctcgc gtttcaaaaa tataagaaag gtcgtgacat 300

<210> 204
<211> 406
<212> DNA
<213> Staphylococcus epidermidis

<400> 204
catttaacag tgaatatact tggctctttaa aacggttttt actgtcctca ataaccccga 60
atttttgtga aaaggaggct ctaaaatacc aagtctcaag aaaaagaaga attaagttta 120
taaagtcctc ttatttcaaa gcgatgtgcg taggatcata atactttatc aattcatcat 180
gtaaggtagt attaatttct tgaagatggg gtttgatttc tgaattcagt gcttctggag 240
cactagataa ttgaacatat aatttaatat atctctcatc aacgtcgaat ataaatttga 300
ataaaaactg gtaaagtccg tcaatggaat aattatcgtc atggttccta agcaaaaaat 360
ctataaagta attgaaacaa ttctcaacac tttttcgata tatttc 406

<210> 205
<211> 325

<212> DNA
<213> Staphylococcus epidermidis

<400> 205
atgtcaaaat tagcagaagc tattgcaa at acagtaaaag cagcacaaga tcaagattgg 60
actaaattag gaactagtat cggtgacatc gtagaaagtgc gcgttagcgt attaggtaaa 120
atcttcggat ttttaattaat cttagttttt taaaatataa atttaaataa ttaattaggg 180
agagataaac atgtcaaaat tagcagaagc tattgcaa at acagtaaaag cagcacaaga 240
ccaagattgg actaaattag gaactagtat cggtgatatc gtagaaagtgc gcgttagcgt 300
attaggtaaa atcttcgggt tctaa 325

<210> 206
<211> 451
<212> DNA
<213> Staphylococcus epidermidis

<400> 206
tgacacaata cctcatgaac cacccaaata agttgatacc cctcacttat ttgttaaaga 60
aatttaaaca agcaaaatcg tcaattagtg aagacgttca aatcattaaa aatacgtttc 120
aaaatgaaaa attaggaact attattacta cagcaggtgc tagcgggtgga gtaacctata 180
agcctatgat gagtaaatca gaggccacag aggttggtga tgaggtgata gagcaattac 240
aagagaaaga ccgtttgcta cctggaggat atttattttt atccgattta gttggtaatc 300
cttctctatt aaataaagta ggtaagttaa ttgctagtat atatatgaac gaagaacttg 360
atgctgttgt taccatagcg actaaaggga tatcacttgc gaatgcagtc gcaaacgtat 420
taaatttacc tgtagtggtt ataagaaagg a 451

<210> 207
<211> 300
<212> DNA
<213> Staphylococcus epidermidis

<400> 207
gtgacagatg taagacttag aaaaatacaa acagacggca gaatgaaagc actcgtttcc 60
attacgctag atgaagcttt tgtaattcat gatttacgtg taattgaagg aaactcaggt 120
cttttcgctc caatgccaaag taaacgtaca ccagatgggtg aattccgtga catcgcgcat 180
cctatcaatt ctgatatgag acaagaaatc caagatgcag tgatgaaagt atatgatgaa 240
actgatgaag ttattccaga caaaaatgct acttcagata acgaagaatc agacgaagct 300

<210> 208
<211> 380
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 208
atgaaaataa tcaactcaga taaggtagcc gaagcactag gcccatattc gcatgcaact 60
gttataaacg gttttgtctt tacatcaggt caaatccac tcacacttga tggaacaatt 120
gttagcgatg atgttcaaga acaaactaag caagtttttag aaaatttaac tgtggtatta 180
aaagaagcag attctgattt gaattctggt gttaaagcga caatctatat ttctgatatg 240
aatgattttc aacaaattaa tcaaacttat ggaaactatt tcgtcgaaca ccaaccagct 300
cgtagttgtg ttgaagtgtc acggttgcct aaagacgtaa aggtagaat tgaattgata 360
ggtaaagtga aggaattata 380

<210> 209
<211> 245
<212> DNA
<213> *Staphylococcus haemolyticus*

<400> 209
atgaacatga ggcacatcat ctttcttaat ggcattgcgtt tttatggcta tcatggagcg 60
cttcatgcag aaaatgaact tggccaaatt tttatagtag atgtaacact taaagttgat 120
ttgactgaag cagggaaaac ggataatgtc aaagacactg tgcattatgg tgaggtcttt 180
gaagatgtta aaaacattgt tgaagggcca tcttgtcaat tgatagaaca tcttgcagaa 240
cgtat 245

<210> 210
<211> 563
<212> DNA
<213> *Staphylococcus haemolyticus*

<400> 210
ttgaattggg aacgacagct ttgaaagggt caatcgattc agcaaattatt gatcctaata 60
taatacaaca agttattttc ggtaatgtgc tacaaagtgg tgtaggacaa aaccagcac 120
gtcaaattgc gattaaagcg ggtgtacctg atacaacacc agctatgaca attaagagg 180
tatgtggatc aggtcttaaa gcaattatat tagggaaaca gtttaattcaa ttaggtgaag 240
cggatgtagt agcagtgggt ggagttgaaa gtatgacaaa tgccccacaa ttaattctaa 300
aagaagggtca agaaccagtg gaaagcttta tgcattgatg tttaacagat gcctttcatt 360

atgtaccaat ggggtgtaaca gctgagaaca tagctgaaaa atatgacatc acgcgtgaaa 420
tgcaagatga gttcgcaaat cattcacaag ctaaagcagc taaagcgacg caagatggta 480
aatttaataa tgaaatcatc ggtatgactg acgcagaagg ggaacaaatg acttctgatg 540
aaggtgttcg cccaaatagt agt 563

<210> 211
<211> 231
<212> DNA
<213> Staphylococcus haemolyticus

<400> 211
aatgacgatg aaacttcctt tgcacaccgt gttgaagcgg atggctggga aatgaattg 60
gctatggttt ttgttggtat taataacaaa tctaaaaagg tatccagtcg ttcaggcatg 120
tcacttacac gtgatacatc acgtttttat caatattggt tagataacgt tgaaccagat 180
ttgaaagaga ctaaagaagc cattgctcaa aaagatttca agcgtatggg t 231

<210> 212
<211> 278
<212> DNA
<213> Staphylococcus haemolyticus

<400> 212
catcaattgt gtgataatga taagaattat atgcaagttg ttaaacadat tggttcttta 60
gtgtattcag ctagtgaagc gattgagcat catagttttg atcaattagc tacaatcttt 120
aatcaatgtc aagatgactt aagaacattg acggtgagtc acgacaaaat agaaatgttt 180
cttcgcttag gagaagagaa tggttcagtc gctggcaaata taacagggtg cggccgtggg 240
ggtagtatgc ttatcttagc taaagaattg caaacagc 278

<210> 213
<211> 200
<212> DNA
<213> Staphylococcus haemolyticus

<400> 213
acgtatatcg tcctgaatat tttctaagta gtaaataagac ttatcgtcat cagtttggtc 60
agtagcgtga tcgaattcta aatcatcgaa tcgcttgaag aaactttcat agtcttcaac 120
tgaaacttct tgacgttcat tcaataaggc tttatgtcct tcaatatcta attgtttttc 180
atagccttcg actagcgtag 200

<210> 214
<211> 565
<212> DNA
<213> Staphylococcus haemolyticus

<400> 214
aatcgtccac ttgtcttttg aaaatgactt catataaact ttgcctaact taatttgaaa 60
ggtaagggttt atggcgcatc aatttatata actagagaag acctttaag cattccaaaa 120
tagtcgtagt agtcacgaac aagatagatt atttatagat atagtaaacc acatacaacc 180
taaacttttt ataaaattta aaagttatgg aatacaaaat gaagatattg aagatttagt 240
acaagaaact ttaatcagga tttatttagc acttcataca tttgatttta gtacagacgt 300
tccttttgaa cactatttga attgtatcgt acgatcgatg cgaaatgatt tttggagaag 360
aaaatatatt gagactgata agtacgatag catcattaat gactatgtta ttgactacaa 420
attgaatcaa tcaagtaa atattgaaga tatttgtatg ataaaagaga aacgagaatt 480
gctagcgagt agtttaacag tattaagtcg attcgagcga aacgtagctg aattactaat 540
gtctgattat acgcctagtg aaatt 565

<210> 215
<211> 635
<212> DNA
<213> Staphylococcus haemolyticus

<400> 215
ccaagatgct aatgtgtctt caaaagaatc ggaaatcgac aaaaatatta ataaagtaga 60
cgacgcgcag tcttattctc aacaaaatga gcaacaatcc tcaaaagccg aaaataagga 120
aatacagaat tcaacacaag cagaacaagt tgaaaaacag gaacaacctg cttctaataca 180
gacggctaata cactcttcaa aagagtcctc cattaataat caggaaagtc ataacaaca 240
gcaacctagt gatgacaaaa cacctaatat caaaccagaa aaaattgaaa aagtagataa 300
tcataagcgt attcaagatc agtatcaaga taaaaacaag caggttgata ataataatc 360
taacaattcg caattaaacc aaaaagaaca tccaattca tcaaataata aacaacaaaa 420
gcaacgtcta gatgttaa acacaaaacga taaccaacaa ttacaatctc gaaatgatgt 480
aaaagaaaaa ttagataacc agccaattga gcaaaaagat accaagctgc aaagtaacaa 540
taaaagcaaa gacaacacaa cttctgtaaa gtcacacagc caacaacata aaccgcattc 600
attaaagacc caatcccatt taactccagg tcaaa 635

<210> 216
<211> 468
<212> DNA
<213> *Staphylococcus lugdunensis*

<400> 216
tgcgaattaa acagttaggc attaatgac aaatgaattg cgtaaaattg tataatgata 60
ccaaggagcg tgacgctaatt ttgaaggcga tagacaaaaa aattgaaaga ttgctagat 120
acttgcagcg tcaaaacaat ctagaccata ttcaattttt gaagatacgc ctaggcttac 180
aagtcgcatt aggtaathtt ttcaaaacta ttgttactta tgggtgttgct cttttattcc 240
atacctttct ttacacatta attacacact taacgtatht ttctgttaga cgttttgccg 300
atggtgcaca cgcaaggcca tcattgttgt gccacattca aaatttagtt ttatttgttg 360
cattaccttg gtcaattgtg ctttttcaag tgtcttggaac attcatgatt ttgttagcat 420
ttatcgcat cataattatt atatgttacg caccatcgcc aactaaaa 468

<210> 217
<211> 450
<212> DNA
<213> *Staphylococcus lugdunensis*

<400> 217
tttaattgtt ttatttgttg ctaaaatagt agccgatatt aaatttcaaa tgagggatta 60
ttttgccatt ttgtgtatca taatcccttc aactatactg ttggcggtga taggtagaca 120
gtctttaata tttttgataa ttggatgttt aatattcttt tatttgaaaa taggcttata 180
ttccgtttta gcaatctttg gttctgcgct tattatgtat gttagtaatt atatttctgt 240
catccttagt gtaattgctg attathtttt tttaagttat atagttcaaa taataataat 300
attagtttctg ttactctaa tatcaataat ttgtgcttat ttcattaggt ttctattaat 360
aagctcaaaa aaaacctatc tgtatttcaa caaatatac atatcagtaa tatctatttt 420
ccttatttta tctttgatca tgctctatht 450

<210> 218
<211> 466
<212> DNA
<213> *Staphylococcus lugdunensis*

<400> 218
tatcaatctt tcaagcagtt atgttaataa ttgtagctaa aattattgca aacgttaagt 60
tttacttaag ggattattta gccgttgccg gcataatagt cccttctgcc gtattatttg 120

ttgttttttg cagacaatca attatctttt tacttattat ttgtttaata tacttttatg 180
taaaaatagg gttttattct ataatcgcta tattaggctc tgccttaata atgtacataa 240
gtaacttttt ctcagtttca ctcataatat taataggtaa ttttatcaaa tttaggataa 300
tatacgtaat aatttcttta tcatcataca tactgatagg tgttttatgt gcatttatga 360
caaaatactt aattaataaa ctcaaaaaaa catacttatt ttttaataaa gtatacataa 420
tcgtcatatc tactttttta acatttacca tcgctatatt ttattt 466

<210> 219
<211> 512
<212> DNA
<213> Staphylococcus lugdunensis

<400> 219
caaaggagtg tgattttatg tcaaaaatgt tagttctttt ttctacatgt attcttttaa 60
tgtcgatgtc gttaattttt atgectgtta gtcatgcgca aggtttatcc tctaagcaag 120
caacgttgta tcagcagaat ccaaaagata ctaatactca agtttcagga aaactgaata 180
attcgaaaga aacaaaagca aatgatacag caaccttatt tgcaaactct aaagtcaatc 240
aatatattat cgacaatcat cttcagcatt cgccagtagt aaaagatcca cgtatggata 300
cacttcctaa attagaatat aaaaacggca cttacatggg tgttggtatt cacgaagtgg 360
gcgaagacaa tcgtccttta caagtatggg tagatcgcat gtatgaaact tatactagag 420
catttgtaca cgcattcggt gataataacg aaatacatct tactgcacct gcagaatatt 480
atgtgtgggg agctggctct aaagctaatc ca 512

<210> 220
<211> 646
<212> DNA
<213> Staphylococcus lugdunensis

<400> 220
gaagtggagc gtaatttgct aaaacaacaa atacagcata ataatgatgc tactggtgac 60
actcaagatg ataataatta taataatgaa atatcaaact aggaagcaac aacgcagaac 120
aaacaaataa ctcagtctga caatgtaaat agcgaggcac aagcaataaa tgaaataagc 180
gacagccatc gtacagtaaa taaagccact gaagcactag acaataactc tacttttaaat 240
acatccaccg atgtatcacc tgcaacgaaa caagatacaa ctactagcaa tcaaacaact 300
caggaaaaca atgatgcaac aacacaaacc aaaacaaatt ataagcaaga tggtaataac 360

aacgtattat cccaagtagc aaccaatgac aatcagtctt caaatcaacc acgtaacagt 420
cacctaaata catccacagt aacatacaac aataatcatc aagtaagaag attagcaaaa 480
gttgaagcaa caaatacaga taataacgtt actcagactt cagacatatc gaataaactc 540
tcaaattgtaa cagcgacaat tgaagcggca gatacgattt acccacataa agcagaatat 600
gtaaatttaa attatcgttt ccaagcccca gatgatgttc aagcag 646

<210> 221
<211> 500
<212> DNA
<213> *Staphylococcus lugdunensis*

<400> 221
tgtcaggat cgtagatgca attactaaag cagtacaagc aggttttagat aaagattggg 60
ctacaatggc tacaagcatt gctgatgcaa tcgctaaagg ttagactttt atcgctgggt 120
tctttaacta aatatataat tgagacttta acaataatcg taaaaggag cgtttacaat 180
atgtcaggta tcattgaagc aattactaaa gcagtacaag caggtttaga taaagattgg 240
gctacaatgg gcactagcat tgcagaagca cttgctaaag gcattgacgc aatttcaggc 300
ttatttggtt aatctcaaata ataataaata atactattta aaataaaaat atttttaaag 360
gagcgaacat atcatggacg gaatttttga agcaatttct aaagcagtac aagcaggttt 420
agacaaagac tgggctacaa tgggtactag cattgcagaa gcacttgcta aaggtgtaga 480
ctttattatt ggattattcc 500

<210> 222
<211> 500
<212> DNA
<213> *Staphylococcus saprophyticus*

<400> 222
gaaataaccg cattccaact aacactttta ttaatggaga aaagagaacc aaaccaatcg 60
atgtgcctga aattttttaa gtcttaagct caatgattcg tagacgttta tatcattttg 120
ctatacatcc aatgaccaa gaagatttgt gtcaagatgt gtcgtaaga ttatactgtg 180
catttaaaaa atttgatttc actgatgaca cacctattga gcattatgta aatcgtgtga 240
ttaaaaatgt aaaaatgat tatatccgta aaaaatgcta tggcaaccaa cgacaagaaa 300
tgctggctcaa tgaatttata gtcaatgatc aaaatagtaa aacagaacac ccacttgata 360
aacatatatt agcttttagag ataggaagtc aattacaaca gggattaatg aaactgacgg 420

tcttagaaaa aagtatcgta atctatttac taaatgactt taagccgaaa gaaattgctg 480
aaacactaaa tatacaaatac 500

<210> 223
<211> 432
<212> DNA
<213> Staphylococcus saprophyticus

<400> 223
aagagaacca aaccaatcga tgtgcctgaa atttttaaaag tcttaagctc aatgattcgt 60
agacgtttat atcattttgc tatacatcca aatgaccaag aagatttgtg tcaagatgtg 120
ctcgtaagat tatactgtgc atttaaaaaa tttgatttca ctgatgacac acctattgag 180
cattatgtaa atcgtgtgat taaaaatgta aaaaatgatt atatccgtaa aaaatgctat 240
ggcaaccaac gacaagaaat gctggtcaat gaatttatag tcaatgatca aatagtaaa 300
acagaacacc cacttgataa acatatatta gcttttagaga taggaagtca attacaacag 360
ggattaatga aactgacggt cttagaaaaa agtatcgtaa tctatttact aatgacttt 420
aagccgaaag aa 432

<210> 224
<211> 200
<212> DNA
<213> Staphylococcus warneri

<400> 224
aaaagatatg acataatggt acgaatagtt aaactatccg gatcaaagt taactttaca 60
cattcagcat aaccatcgta ttcaccattc aaattcgatg ttattccatt agcccttcca 120
gcttcagttg atacgatacc tgggtatagtt ttaaaaaaag cttgaacgcc ccacaaacaa 180
ccgccagcta catatactat 200

<210> 225
<211> 515
<212> DNA
<213> Staphylococcus warneri

<400> 225
catccaattt acagaacat ctttttcatc tatgactgca ttattaatta taatgcttac 60
taaattgtcg attgcatcgt caatattgtc tgaatttact atttcatatc cataatttat 120
aatccatta ccatcaataa ataatttatt ttgactttct aatgaaaatt ttattagttt 180

acattgaaac aacaaatctt tcaaagaata tctttgcggt ttttctaaaa atacattgag 240
tgggtttttc aataagtgat gtaccgtatt atttttaata tcttttaccg aaacactttg 300
gaccttagta taaaaatagg gtactgaaag agtttctatt tgttttattt ctgaatttat 360
taacttatca cttaataaat tttcacgta ctcttctagt ttgttaaaca agctctttcg 420
cttatttgca taaagaggtg atttagcagc ttgtattaat actgagtact caattgtact 480
tcttggtaaa attctcactt ctacttctga tgacg 515

<210> 226
<211> 320
<212> DNA
<213> Staphylococcus warneri

<400> 226
tgtatcaact ccactttatt catattaatg acgacgcact tacactcaca aagtcaaagc 60
aagacaccat tcacttattt ataggcaatt ggattaaccc atcagcccaa aaatctatta 120
gcattcgaac tggcggtgat acgaatcaca atcaatatca aattcttcaa attgataccg 180
aacatcaacg tattaaactg acttctgaag aagatcctca actcatgtat attttagact 240
acgaagatac aaaccatata ttcatacaaa catcagttaa gaattcgtat ggcacgtcaa 300
gacccataag atacgaaaaa 320

<210> 227
<211> 271
<212> DNA
<213> Staphylococcus warneri

<400> 227
agcaagttct ttgttaattg caactttgac atcagcgaca ttaattaatc cggcacatgc 60
agaaacgaca tcatcaaccg ataatcacca acaaaccaca caatctcaac aacaaaagac 120
accgaagatt gataaaggta ataacgtcaa acctgttgaa aagaaagaac gcgcaaattgt 180
catactacct aacaatgatc gacatcaaat taatgatata acgttaggtc actatgctcc 240
tgttactttc gttcaagttc aatcaaacga a 271

<210> 228
<211> 500
<212> DNA
<213> Staphylococcus warneri

<400> 228
tattgtcaaa gtcacaacaa ttagatatag aattaaaagc gatacttcaa caattcaatt 60

cttttattat gagaagaatt aattatattt ctcaaaatga ttttgaaaaa gacgaccttt 120
atcaagaagt gctcatcaaa atatatctag cgcttgagcg ccatcatttt caatatgatg 180
attcgtttat aaaatatata tcgcggctca tcaaatcagt taaatgtgat tactatcgac 240
ggcattacac tcaacagaag cgatatacga atgtagttaa tgatgctgtg gttgaatatac 300
aaacgaacct gcttaataga gatcgagttg aaagagaaat attaacatgt gaagcaatca 360
aactattgaa cgcggcgtgt gagaaattaa ctaaacaaga acgagaagta tttgaatttt 420
atagtaaagg ttataaacca aaagaaatcg cacatttact aggtataaaa gacaaagtag 480
tttacaatgc gatacaacgt 500

<210> 229
<211> 400
<212> DNA
<213> Staphylococcus warneri

<400> 229
tcagatatata acaattttaac aaggatgtta tcaactgtagc gggtggctac tatctaagat 60
atgcattgag ttatcgtgat atatctgaaa tattaaggga acgtgggtgta aacgttcatac 120
attcaacggg ctaccggttg gttcaagaat atgctcccg tttgtatcaa atttggaaga 180
aaaaacataa aaaagcgtat tataagtggc gtgttgatga gacatatatac aaaattaaag 240
gacagtgggtg ttatctgtat cgcgcgattg atgcagatgg acatacatta gatatttggt 300
tgcgtaagca acgagataat cattcagcat atgcgtttat caaacgtctc attaaacaat 360
ttggtaaacc tcaaaaggta attacagatc aggcaccttc 400

<210> 230
<211> 758
<212> DNA
<213> Staphylococcus warneri

<400> 230
taatcaaacy caacaacaac cttcagaacc aacaaaagcg aaagattctg atacaaataa 60
tacgaatggt gaacgtcctg aatcgaattc gacacaaaca tcaaatcaag aactgacaa 120
aatgcaggat acatcaacta atcaaacaaa cgaaaattct aaacatatta ttgataaaac 180
taatgacgtt tcacatgaaa ctacaaagac aaatgatata gatcaaacgt catctcaaga 240
caattcagaa caatctcttg aagtcgactc aaatgaggca ccagcttcaa atgacaaatc 300
aactccaacc aaacaagaac ctactaattc aaagcaagat attgatgaaa catctaaacc 360

taatgaagat tcaaaacttg taccatcaaa gtcaaatata acatctaaag cagataaaca 420
 agaacagtct tctaaagaac ctggtgagga taatgctcaa aaagataaac atgtatcaca 480
 agaagattca tctttagaaa agcaagggtac acaagagggtc ccgcagactg acacacataa 540
 agatgtcaat gtaacacctt caaagtcac atcagaacaa caactatcta caacacaaca 600
 cattacagct aaagattcta gtgcttcaca agagggtgcca gttcattcac tagattcatc 660
 taaacaagat cacacaacat cgactgagag ccatatcaat ttagataacc tagataaaca 720
 agcgactaaa gatcggtacac ctacagataa tggcgatg 758

<210> 231
 <211> 562
 <212> DNA
 <213> Candida albicans

<400> 231
 aaacgcattg ttaagagacc cagaaatcaa aactggtaaa gtgtctgttg cttcatactt 60
 gaagtttttg gattctgttc aattcaagag ttatggagac gaacctttgg aagtattggc 120
 tattgtggta gaacaaaatg acaaaattcc taaattagac gagtttttgt catccaagac 180
 aggttggtta aacaatgtta ccgataatat tttcaatgct atcaagaaag attacagtca 240
 attatggttg gttgttaatg aaaacgatgc caacttacct tggatattct ccaaatacaga 300
 tggttcatth gccagaatg gccaaatctt gttttggtac ggtttaaaca ttgacgaagc 360
 tagtaaattg attaaagaat ttgattcttc atctattgga tcatcggtgt catcttctaa 420
 agaatctggc gtattcacat ctgctcaaca aaagcgtggg ttccaccact ctacagtccg 480
 tagaaacacc aatcctaate ctccattatc tgaaggtaag caaacgaga gaaaaaaagt 540
 tgctttgatt ggtgctagag gt 562

<210> 232
 <211> 524
 <212> DNA
 <213> Candida albicans

<400> 232
 caggtaagtc aaagtctggg gagttatctt ctactgggtc tgtgacaact aatacagcaa 60
 caccagatgt tccatcaact aaagtacctt cgaatccagg ggcaccaggg actggtgttc 120
 caccaccttt agcaccatcg acagaaacac aaactaccaa taatgtacca ggctcaccaa 180
 atatccctgc cactggaaca actgatatta ttagagaatc aactactgtt tcacacacag 240

tgaccgggaa tggaaatact ggcgttccaa tgaatccaaa ccctgcgttg acaacaggca 300
 cttcactgac tggcgcaacg aattctgcaa ctaacccatc tcatgaaaca ggtgttaata 360
 caggatcagg aggtcgaact aatattgtca ctccaccttc ttctgcaact gcgacagtgg 420
 ttattccagg aactgataat ggtgctacta ccaaggggtca agatacagct ggtggcggca 480
 actctaattg atctactgct accaccaata tacaaggtgg caat 524

<210> 233
 <211> 230
 <212> DNA
 <213> Candida albicans

<400> 233
 gattaatgac atcaaggggt tagttaaagg cattaaaggc aaaaacggga aatcctactc 60
 aagtgtccca gttgggactg ttgattcttg ggatgtctta gttgatgggt ccagtaaacc 120
 agccatcgat gctgcagatg ttgtctactc caactccttc tcatactggc aaaaaaacag 180
 tcaagctaatt gcttcatact ctcttttcga tgatgttatg caagctttgc 230

<210> 234
 <211> 632
 <212> DNA
 <213> Candida albicans

<400> 234
 tctggtgaag gtttaggaag aaagaaatca ttaattagac cagaaagatc aagaatggat 60
 gaaagccatc cacgattcca ttatactcaa gttgcaaadc aagaatctaa tcatattaaa 120
 gtacagccat cttcaactgg tgttgatcct cgtaaataca atgaattatc aacatcaaga 180
 tcacatttga gtaattacgc tactccacca catcaagagg aagaagaaga cgaagggatc 240
 cctttaatgg atatacacia tgcttcaccc aatgttagca gtgacaaaaa taatgatcta 300
 aaaggtggac gtgaagttta tggattaaat gatgaaatca acgattatgg tagttcaccc 360
 aagaaaaacc aagtcatttc atcttcaaga ccaatgaaca acgaaaaacc agctaaacct 420
 aaacatgata tatatttctg gaaagtttat tgttatgcta ttacattttg ggcaccagct 480
 ccattattga aattatttgg attaccaaca aaagatcgtc aattcgcttg gagagaaaaa 540
 ataggggttg tttcttgtat tctttacggt ggggcatttg ttgcttattt gacttttggt 600
 ttcactaaaa ctgtttgttc gagtcaagtg gt 632

<210> 235
<211> 633
<212> DNA
<213> Candida albicans

<400> 235
caccaaactc aggtttattc aaacaaggat actcctcctt ctccaatgcc gacggagcca 60
ttatcagaaa tgttgaagca gttcgtgaaa tcgcctctat cttactcacc tccatgggtc 120
caagtggaag aaacaagatc atcgtcaaca agttgggcaa aaaattcatc accaacgatg 180
ccgccaccat gcttaacgaa ttggaaattg tccaccccggt agtgaaaatc ttgatccagg 240
catcaaagca gcaggaattc gaaatgggag acaacactaa cctagtaatc atccttgctg 300
gcgagttcct caacgttgct gaaaaattgt taacattggg cttgaatgtc agtgaaatca 360
tccagggggt caacttggca aacaagtttg tgatgaaaac attggacgag ttggtcgttg 420
aaaaagtcga gtcgttcgaa actgacctat taaaagcagt gaagccagtg atcgccgcta 480
aacagtacgg cgtagaagat accatcgcca aactcgtcgt tgatgccgtt gccctagtta 540
tgaagaacgg gtctttcaat gtcgacaaca taagagtggg caaggatcatg ggtgcatcgc 600
tctcccaatc gcaagtgggc aagggtatgg tct 633

<210> 236
<211> 465
<212> DNA
<213> Candida albicans

<400> 236
gaatgcaaag aaacattgaa atcaagagta ttttgatcca attgaccatg tatgctaagc 60
ttaacgaaag ggtcgactat ttgttggaag agttaacatc cactgaatta ttggatagtg 120
aaaaagtcag gtcaaagttg aattcagaat ttgatcctca agaaaaattc gattatgata 180
aattgattaa agacaagggt ctgaccttga gaaaaggatt gaaagatttg aaattcgata 240
gagaagagat tgaaaatact ccttgctata atgaaatgat tgaagatttg tttgttcaaa 300
tcaaggatga tcatccagag acaaaaaccg atggcgacaa attgattgaa tacttaaaag 360
aacatagaaa caggatcgac gatgttttgt ctaaacagac tataaaattg gatgatttat 420
tgtaccagaa agctcaattg atagtaagtg atgatttgca tacgg 465

<210> 237
<211> 504
<212> DNA
<213> Candida albicans

<400> 237
tgtctgctgc tagtgaatcc aaatattcta ctgaagtgc ttccgaatta ttgagcaaatt 60
tacaagttgc tgataataag gatgaagctg cttccaacat ttccactttt ttaaactcat 120
ctattgttga acacgatgtt ccagttgaat ttttcgaaga tttgaaaaaa caaattcaat 180
ctaaagatgc taaagtttct cttgctgctt tggatgctta caaacacatt gcttcaacca 240
acggtttatc cccatccgtt gaaccatatg ttgttgactt ggtagtgaa gttgccgtta 300
aagctggtga caaaaacaag gatgttcaaa ctgctgcttc tgatgcttta ttggccattg 360
cttctgccat caccccaact gctgtcaaag ccattctacc aaaattgatt gacaacttga 420
ccaacaccaa caaatggact gaaaaagttg ccattctgag agctgtttct caattggttg 480
aactgctaa agctcaaatt gctt 504

<210> 238
<211> 526
<212> DNA
<213> Candida albicans

<400> 238
tgacaggttc attggtgtct tacaaaagtc ttggtaaaaa aggtggattt tggattttca 60
cattattcaa ttatctctgt atcgggtgttt tgacatcttt gttcattgtc tccattggta 120
atagaccaca tgcaccaaag aatattttca aaacattaat catattgtta accatatgtg 180
cattatacgc attggtggtt ggatttgtgt ttgttatcaa tactattgct acttttggaa 240
ccggtggaac atctacctat gtgctcgta gtattgtggt ttcattgttg tccacctatg 300
gtctttatac gttaatgtcc attttgtact tggacccatg gcacatgttg acttgttctg 360
tacaatactt tttgatgatt ccacgtaca cttgtacatt acaaatattt gcattttgta 420
atactcacga tgtctcgtgg ggtacaaaag gtgacaacaa tccaaaagaa gatttgagta 480
atcagtacat tattgagaaa aatgccagtg gagaatttga ggctgt 526

<210> 239
<211> 621
<212> DNA
<213> Candida albicans

<400> 239
tcagatggtg atgaactgtc gattgaattt cttaaccaa gaagcaacac tccattaaca 60
caaggaactt ataattatca taatacttct actaattcac ttaatttcca acaaccagaa 120

ccaattttatc gtaatcaaac tcgtacatct ttaagtgatt cttattatga tcatcccata 180
 ttgacactt ctcaaacaca gatccaacct ccacatgata atccattcac tgaaagttat 240
 gaaatgacag atacttcata tcaaggtaat gatcatcatt atcgtactgg tcaacctaat 300
 catctcatga accccactta taaccaagct ttcattcctc atgtttatga tgaagaagat 360
 aatgatgaac aagaatatga tcaacgtatt cagtataatc aatttcaagg ggatcatttt 420
 gatttggcag cgattagtta tgctgatgat gaaagtcaaa gtcagttgga ctatgtcccc 480
 actgaacgtg tcatacctga aggagaggaa gaagaagagg aaggtgagac gagttttgaa 540
 aaagaacctg gtagtgaaac catttctggc ccatttggag aagaacgatc atttgaagaa 600
 cctcctccac aacaagaagt c 621

<210> 240
 <211> 607
 <212> DNA
 <213> Candida albicans

<400> 240
 aactagggct gctaattgtt ccactgaatt aactgctgct gcaccttatg aattgggtaa 60
 attatattat aatggatttg aagatatgtt cttgattgat aaaaaatatg gattagaatt 120
 atttgctcaa gcagcagcat taggtcattt acaatcagcc gccatttttg gtcatcatta 180
 tgaaattgga gaaattgttc ctcaagattc taatttatca attcattatt atactcaagc 240
 agcattagga ggtgatccaa attcaatgtt ggcaatgtgt gcttggtatt tagttggtag 300
 tgaaccatat ttacctaaag atgataatga agcatttgaa tgggctaaac gtgctgccaa 360
 ttgtaattta ccaaagctc aatttgcttt agcaaatttt tatgaaaaag ggattggatg 420
 tattaataat attaataag ctcaatcatg gtataaaaaa gctgctgaaa atgggtgatga 480
 aaaatctttg aaacgattaa ctgataaaga attgggttaa accattcaaa aacaatggaa 540
 aaagaaacct ccagtaattc ataataaga tggaacttct acaactaatt caggatctct 600
 tgctcaa 607

<210> 241
 <211> 693
 <212> DNA
 <213> Candida albicans

<400> 241
 agtcagagca gggatcaatc tcaaatcag atgtgatcaa gatttcgata gtgaaaaaga 60

agaggcagag aaattttacca aaatttcagga tgagatttta caaacatttg ctacaaattt 120
 gccacaacca ccaaatttga aaatcaagaa cgttactcaa acctcgtgtg ttttagaatg 180
 ggataaacta aacttgggca ccgccacatt gaaaaatctt attttattca aagatggtaa 240
 aaaattaggc tcaattcctc agccattaaa taatcgaacc tcaaaattgt ctggattgcc 300
 aattgacaaa tcttttaaag tacaattacg tttggatacc actgctggta ctttcttgtc 360
 gaatgaaatt gaggtaacaa cccacaaaat gactgatttg tcaggaatta ctgtgtgtct 420
 tggtgacctt acacctaatg atcaattcaa caaggaggac attgaagagg cattaaagaa 480
 tatgggggca aaatatccag tgcaacaaca agtcaaagtc gacactacac atttcctctg 540
 tactagagaa aacaaacaaa atcctgaata tgtgaaggca aatgatatga acattccaat 600
 aattagacca gagtgggtga aagcctgtga gagagaaaga agaatagttg gtgttagaga 660
 cttttatgtg aaagattgtg tcttaccoga cat 693

<210> 242
 <211> 511
 <212> DNA
 <213> Candida albicans

<400> 242
 gtcaacaaca aggcaagaca attttacttt cacttggagg agccacgggc aattacgggt 60
 tttcttccga ctcagaagca gttcaatttg caggaacatt atggaataaa tttggagggtg 120
 ggaaagactc agaaagacct tttgacgatg caattgttga tgggtttgat tttgatattg 180
 aaaataaaga ccagacaggt tatgctgctt tagcgactca attaagaaaa tatttttagca 240
 ctggaactaa atcttattac ttgtcagctg ctccacaatg cccataccct gatgagtcgg 300
 ttggtgactt aatgtcccaa gttgatttag attttgcatt tatacaattt tataacaact 360
 actgttcgct caatcagcaa ttcaactgga actcatggag caactatgcc agaggtaaaa 420
 gtattaaact ttatttgggc cttcctggct catcatcgtc tgctggctcc ggatttgttg 480
 gtttgtcgac tgttcaaaga gtcgtggcta g 511

<210> 243
 <211> 510
 <212> DNA
 <213> Candida albicans

<400> 243
 ctgtcaagaa actgacgttg acattgtttt attgtcattc ttgaatttgt ttccagatcc 60

attgaacggt aattttgcca accaatgtgg taacactttt gaatctgggt tgttacactg 120
ttctcaaatt ggtgctgaca tcaaaacttg tcaatcttta ggtaaaaccg tgttggtatc 180
tttaggtggt ggtggtgggt actatgggtt cagcgatggt gcttctgcca ctaaattcgc 240
agacaccttg tggaacaaat tcggtgctgg tgaagatcca gaaagaccat ttgatgacgc 300
tggtgttgat ggtttcgatt ttgacattga acacgggtgg gctactgggt accctgaatt 360
ggctactgcc ttaagaggca agttcgccaa agacacttcc aaaaactatt tcttatctgc 420
tgctccacaa tgtccatacc ctgatgcac tcttggtgat ttattatcca aagtccact 480
tgattttgca ttcattccaat tctacaacaa 510

<210> 244
<211> 577
<212> DNA
<213> Candida albicans

<400> 244
ttggctcgat taagaaataa attaaattca aaatatatta tcacggtagc ggctcctgggt 60
ggtagtgata atattgaaat tttgaagatt caagaaatgg ataaatattt gacattttgg 120
aatttaatgt gttatgattt tgctggtgaa ggctgggtctt cgaaaactgc tttccattct 180
aatttatattg gtaataatgg ggataattca ttgaatgcat ctgatgttgt ccaaacttat 240
attaacaagg gagttcatcc aacaaaattg atattaggga tgccaatgta tggaagaata 300
tttcatgggtg ttgatcgacc agaaattgggt attcctttta caaaagagag aaaatcaggt 360
tgtatagaag ctgatgttgt ggactataac aaatttgggtg atacattcga ttatgaagat 420
tttgatccac gcaaagtggg tgcattgaaa tatgattccc atagtaagca attaattaca 480
tttgataatc ccagtggtgc tagaataaaa gctagctttg tacaactgag acaattgggt 540
gggtgggatgt ggtgggattc tgctgggtgat gtttcag 577

<210> 245
<211> 909
<212> DNA
<213> Candida albicans

<400> 245
gctccatcta gcaactcatc tgggtgttcca gctgcgccat ctaacaattc atctgggtgct 60
tcagttgttc catcacaatc agccaacaat tcatctgctt cagctgctcc atctaacaac 120
tcatctagtg ctatttctgg aagtgttgca ccatcaagct acggaaactc taccattgca 180

caaccatcta cttctacaaa atccgatgct gcatcaatta ctgggtccaat tactacagac 240
aagggtataa ccaatgagtc tggcattgtc tttacatcta cagtaatcat tacacatggt 300
tctgaatatt gtgaccagac ttctgctgct gctgttcaat catcagcatg tgaagaacag 360
tcaagtgcta aatcagaaca agcttctgct tcatcagaac aagttaaggt cattactagt 420
gtgggtttggt gtgagtcac tattcaatct attgaatctg tcaaaacaag tgcagaagct 480
gctcataaga ctgagggttat tgctagttgt gcaagtgaat taagctcttt gagttctgct 540
aaatctgaag ctatgaagac tgtttctagt ttagttgaag ttcaaaaatc tgcagttgcc 600
aaacaaacct cgttggctgc tgtacaatca tctgctgctt ctgtacaatt aagtgtgct 660
cacgccc aaa agtcgtctga ggcagttgaa gttgccc aaa ctgctgttgc tgaagcttct 720
aaagctggtg atgaaatttc gactgaaatt gttaacatca ccaagacagt ttcttctggt 780
aaggagactg gtgtttccca agctactgtt gctgctaaca cacattcagt tgctattgct 840
aatatggcaa ataccaagtt tgccagcaca atgtcgttgt tggtcgctag ttctgtgttt 900
gttgggtctc 909

<210> 246
<211> 537
<212> DNA
<213> Candida albicans

<400> 246
gacactcogt cagattcaac tccaactaaa aaaccagaac cgactataag tccagagttt 60
agaaaaccca gcataagtct gttaacttct ccaagtgttg cacataaacc tccgccacta 120
ccaccgtcac tgagtctggt tggaagtagt gagcattcga gtgcaagatc gtccccggct 180
atcacgaaga gaaactcgat tgcaaacatt atcgatgctt atgaagaacc agctactaaa 240
actgaaaaaa aggctgagct aaactcacca aagataaacc aactgacacc ggtgccaaag 300
cttgaggaac acgagaatga tacaacaaa gtagaaaagg ttgtggatag tgcacctgaa 360
ccaaaaccaa aaaaggagcc tcaaccagtt ttgacgacc aagacgatga cttgacaaaa 420
atcaaaaagc tcaagcaatc taagaaacca cgtcggtatg aaacacctcc aatttgggcc 480
cagaggtggg ttcccccaaa tagacagaag gaggaaacta atgttgatga cgggaat 537

<210> 247
<211> 561
<212> DNA
<213> Candida albicans

<400> 247
acatagtcag ccacaaccac aaccacaagc aacacaacca agatcaaata gaagtagact 60
gcaaacgagc ttttctaaac caagaggtag caggcaagtt agtggcagtg gcaggtcaac 120
cggggccaaag aaacaatcag caatcacact gggcagtact ggtactggcc ctgcccgaag 180
tgctgataca ggtatgacat cagttgctaa tagcacttcc acaaccacta tgacaaccac 240
caacaataac aacaaattgt ctgtttcagc cccagtaaatt gtgatatatg ctaattcttc 300
tgagagactt caacaggtgt taccagcacc gccgttatca cgtgctccag taagacctga 360
tgtaacggtc aatttgacat caaaacgagc caaaagaaaa tcaaaattca ctccggaaca 420
agatgacatg atcgtgaatt tgaagaaaaa ggggaaatca tgggttgaaa ttgccgaaat 480
cactgggtgtt ggatcatatt tagcggcacg gaatcgattt caagttattg ttggacagca 540
aggaaataac aattcgagtg c 561

<210> 248
<211> 351
<212> DNA
<213> Candida albicans

<400> 248
tcaagaaagc tactgatggt ggtccacacg gtgctatcaa tgtctctgtt tctgaaaaag 60
ccattgacca atctgttgaa tatgttagac cattaggtaa agttgttttg gttggtttac 120
cagctcacgc taaagtcact gctccagttt tcgatgctgt tgtcaaatcc attgaaatca 180
aaggttctta cgttggtaac agaaaagaca ctgctgaagc tattgacttc ttctccagag 240
gtttaatcaa atgtccaatc aagattgtcg gtttatctga cttgccagaa gtcttcaaatt 300
tgatggaaga aggtaaaatc ttgggtagat acgtcttgga caccagtaaa t 351

<210> 249
<211> 707
<212> DNA
<213> Candida albicans

<400> 249
ctcagtcctt tgctacaacc actacagtta ctgctcctcc aggtgggtacc gatactgtga 60
ttatcagaga gccaccaaac catactgtca ctactactga atattgggtca caatcctttg 120
ctactactac tactgttact gctcctccag gtgggtactga ctcagtaatt atcagagaac 180
caccaaattc aactgtcact acaaccgagt attgggtctca atcctttgct actactacta 240

cagttactgc tctccagggt ggtactgact cagtaattat cagagaacct ccaaacccaa 300
ctgtcaccac cactgaatat tgggtcccaat cttacgcaac cacaactact gtgactgctc 360
ctccaggagg cactgactca gtaattatca gagaaccacc aaaccacact gtcactacta 420
ctgaatactg gtcacaatca tatgccacca ctaccactgt aactgcacca ccagggtggt 480
ctgacactgt tatcattaga gagccaccaa accacactgt cactactact gagtattggt 540
ctcaatcggt tgctactacc acaactgtaa ctgggtccacc aagtggcact gatactgtta 600
tcattaggga accaccaaac ccaactgtca ccactactga atactgggtct caatcatatg 660
caaccactac taccattacc gctccacctg gtgaaactga taccggt 707

<210> 250
<211> 586
<212> DNA
<213> Candida albicans

<400> 250
aacggtcata tccaaagaag ttactgggtgt tttcaaccaa ttcaattcat tgatatgggc 60
ttacacatac agagctcgat acgaagaaat atctactctt accgctaattg ctcaattgga 120
atgggctttg gatgggtacta ttgccagtcg cggtgataca ttacattag tcatgccctg 180
tgtatataaa ttcatgacgt acgaaacctc agtgcaatta actgccaaact ctattgcata 240
tgccacatgt gactttgatg ctgggtgaaga cactaaaagt ttttcaagtt tgaagtgtac 300
ggtgactgat gagttgacag aagataccag cgtttttgga agtggtattt tgcctattgc 360
tttcaatggt ggagggtccg gatctaaatc tacgataaca gactccaaat gtttttcaag 420
tggtgtacaac actgtcacgt tttttgacgg aaacaatcaa ctttctacaa ctgcaaattt 480
tcttccccga agagaactag cgtttggtct agttgttagt caaagacttt ccattgtcgt 540
cgatacaatg actaattttg ttatgtctac acctgttttc atgggt 586

<210> 251
<211> 692
<212> DNA
<213> Candida albicans

<400> 251
aacattagaa acggaacagg ccgtcctcgt aagactccca gatccaagct ctatatgggt 60
tccccccac tttcagggtga ggactcaaca aatcctgaac cagaagaggg tagttcacag 120
gaaaacaatc ccacagaacc tagttcctca caatcaaatt cagtacaaaa tcaagacca 180

agtgaagacc agagtcaact accacaacaa gaactgaata cacaacaaga gctgaataca 240
caacaagaac tgaatacgcc atcaccagc ggcgtcaaaca catcaactga aactcctgct 300
cctttaagtc ccatacaacc aggaattcga aatattcctc tgggattatt attaccacaa 360
gaaaaagttg gccgtcttat gggatatcca ttttaccgcg attttaattt taccctaaat 420
ccagagagat atcagaaact tatttatgtg tttcagatac ttaaaaatgc tgctcgtaat 480
cacagaaatg gagcttctct acttagaaag tatttcctgt tagcgagaag gtctaaaaga 540
acaacagaca tgtttgtaac caccatagag gaaatgcgga agaggctgtt ggaaaatagt 600
cgtaagagag agctcgagga agcgcaagaa agggaagagt caaataaaag acaacatata 660
gaatcaagtg cagaaccaa tgcagaactg ag 692

<210> 252
<211> 506
<212> DNA
<213> Candida albicans

<400> 252
caaagttcca ccatttcaac tccagtagac tcattaccta caagtggaag aagtactcct 60
aatccgaatg catcaaccac ttcattaaca tcattgaata ctgctcttgc taaattaaat 120
gtttccaata ttccatttga agaaaatttg agtaatattg agaaagccgg taagatagct 180
gagattagac ccgaagtgga aaccattgtt aagataattg atgaacaaga agatttatgc 240
attattaatg aatggaaatt gaatgaaatt ttgaaatcct tattgaaacc taaaagtcct 300
gcattagtta aagaaggagc tttattaatc attcaacaat tggcaactaa atttggtggt 360
caaaccccca aagaagctta tttattacag tttttaagta ctgcttatga tatgtttact 420
gataaagata aaaatggttg taaagctgct aaatctgcta ctgatgcatt atttggaatt 480
taccctgtgg aagcattagg atcaat 506

<210> 253
<211> 520
<212> DNA
<213> Candida albicans

<400> 253
atcgacatca acaggcttac cacctaattg gacgattaga gtatccagat ccataacaa 60
agagtatttc ttaaaccaat ctaccaatga gtcgtcttgg gaccacctt atggcactga 120
caaagaagta ttgaatgcat acattgcgaa gtttaaaaac aatgggttaca agccacttgt 180

gaatgaggat ggccaggta gagtttctca tttgttgatc aagaacaatc aatcaagaaa 240
 acccaagtct tggaagtccc cagatgggtat aagtagaact agagacgaat ctatacagat 300
 attgaagaaa catttggaag gaatattgag tgggtgagggt aaactaagtg aattggcaaa 360
 taccgaaagt gattgcagct cacatgacag aggtgggtgat ttaggggtttt ttagcaaagg 420
 acaaatgcaa ccaccattcg aagaagccgc attcaatttg catgttggag aagtcagtaa 480
 cataattgaa accaatagtg gtgtccatat cctccaaaga 520

<210> 254
 <211> 507
 <212> DNA
 <213> Candida albicans

<400> 254
 caatagcaca ggcacaatct ggaactggta aaactgctac tttttctatt ggtatgcttg 60
 aggttataga tactaaatca aaagagtgtc aagcacttat cttgtctcct actagagagt 120
 tggcaattca aatacaaaat gtggtcatgc atttaggaga ttatatgaac attcacaccc 180
 atgcctgtat tgggtgggaaa aatgtcgggtg aggatgttaa gaaattgcag caagggcaac 240
 aaatagttag tgggacacca ggtagagtga ttgatgtgat aaaaagaaga aatctacaaa 300
 ctagaaatat caaggttctt atttttagatg aagctgatga actttttaca aaagggttta 360
 aagaacagat ctacgaaatc tacaacatt taccaccttc ggttcaagta gtagttgtta 420
 gtgccacttt gccacgtgaa gtattggaga tgacaagtaa gtttaccact gatccagtga 480
 aaatcttggg gaagagggat gagattt 507

<210> 255
 <211> 535
 <212> DNA
 <213> Candida albicans

<400> 255
 ttcattcaaa ccagccttac cacaagataa actcacgggt gtagatgata tccctgatag 60
 agaacttacc gatattgaaa gaatcaacat caatgctgcc aattccaatt tacaagaaa 120
 attgaaaaca agacatttac aaatgatcgc tattggatca tctataggaa ccggtctttt 180
 cgttgggtact ggtgggtgcat taagtactgg tggaccagct gccattgttc tagcatgggc 240
 cataagtgc atacgggtat ttatgacaat gcaaggatta ggtgaattgg ccggtgcatt 300
 cccagtttct ggtggattca atttatacgc aagtaaattt ttagaaccag gtattggatt 360

tgctgttggt tgggaattatt tcttacaatt ctttgtatta ttgccattag aattagttgc 420
tggtgctata actatcaaatt attggaatgc tagtataaat tctgatgtgt ttgttattat 480
atthttggttt gtggtgcttg tgatcaccat gttgggtgta agatggtatg gtgaa 535

<210> 256
<211> 433
<212> DNA
<213> Candida albicans

<400> 256
cacaagggtta tacattcaga aaactaaaac ttactgatta tgataatcaa tatttagaaa 60
ctttaaaagt tttgacgaca gttggtgaaa tttccaaaga agatttcact gaattgtata 120
atcattggtc ttcattgcca tctatttata atccatatgt aatcaccaat gcatcaggta 180
tagtggtagc cacgggggatg ttatttgtgg agaaaaaatt gattcatgaa tgtggtaaag 240
ttggtcatat tgaagatatt tcagttgcta aatctgaaca aggtaaaaaa ttgggatatt 300
atthtagtcac ttcattaacc aaagttgctc aagagaatga ttgttacaaa gtcatttttag 360
attgttctcc tgaaaatggt ggcttttatg aaaaatgtgg ttataaagat ggtggtgttg 420
aaatggtatg tag 433

<210> 257
<211> 540
<212> DNA
<213> Candida albicans

<400> 257
aaaccataaa tcaacaacca cttgcttcgt caagatgggc tgcttgtgcc attggtggtg 60
ttcttgcttc atttattcaa attcttgcca cacttttcga atggattttc gtgcctagag 120
aatgggcccgg tgctcaacat ttgagtcgtc gtatgctatt tttggtgtta atthttcttac 180
tcaatttggt tccaccagtt tatacattcc aaattaccaa attggtgatt tattcgaaat 240
cggcataatgc tgtgtcgatt gttggatttt tcattgctgt ggccacttta gtattctttg 300
ccgtcatgcc attgggtggt ttattcactt catacatgaa caagagatca agaagatata 360
ttgcatcaca aacatttact gccaaactaca ttaaattgaa aggttttagat atgtggatgt 420
cttatttggt atggtttttg gttttccttg ccaaattggt tgaatcttat ttcttctcga 480
ctttgtcttt aagagatcct attagaaact tgctcgaccat gacaatgaga tgtgttggtg 540

<210> 258

<211> 574
<212> DNA
<213> *Candida albicans*

<400> 258
tattatggcg attccacaga gttgatattg gtgatatcac aaatatggaa cagcattatc 60
atttccatgt acagggagca tgttctctcg gttgaacaag tttgcaagtt gatttatcaa 120
cgaggagctg atgaaaacac tatacgacca ccactatttt ttgtttacga agatgataac 180
aaattttatg attttattaa aatcgaaaag gaatgggaaa gaaggatcac attttttgct 240
caatcgttat caagcccttt accagaacca tttccagtag tttctacacc aacatttacc 300
gttttgattc ctcatctactc agaaaaaata ctattaagtt tacaagattt aattaaagaa 360
caaagctttt caaaactaac gttgctagat tatttgaaac aacttcattc gaaagaatgg 420
gattcatttg ttcaagatag taagatgatc caaactataa aggaaatgga tgaagacaag 480
tttgtacgcg aaaatatgga tgatttgccg tactactgta tcgggttcaa agattcttca 540
ccagaaaatg ttttacgaac aagaatttgg gctg 574

<210> 259
<211> 506
<212> DNA
<213> *Candida albicans*

<400> 259
cgtttggttat ttgctgttcc taaaaagggc agattatacg aaaaatgctg taacttattg 60
agtgggtgccg atatacagtt tagaagatct aatagattag atatagcact ttctacaaac 120
ttgccaatlg cattaatctt cttgcctgca gctgatatcc cagttttcgt tggagaaggt 180
aattgtgact tgggtataac tgggttagac caaatcaaag aagctgaaca attcgacaac 240
atcgaggact tgttggattt gaaatttggg tcatgcaaat tgcagatcca agttccagca 300
gatggcgagt acgaaaagcc agaacagctt gttggaaaga aaattgtgtc ttcatttaca 360
aaattgagta ccgactattt caaacaattg tcagacaaac ctactaatat cagatatgtc 420
gggtggttccg ttgaggcttc ttgtgccttg ggtgttgctg atgctattgt cgatttggtt 480
gaaagtgggtg aaactatgaa agcagc 506

<210> 260
<211> 539
<212> DNA
<213> *Candida albicans*

<400> 260
agctaaatcc aaagacgatg acgcatcggc atatgtcggg gtcgggtcca tcgctgctgg 60
tggccgttac gacaatttag tgggtatggt ctccaacggg aaatccatcc cttgtgttgg 120
tgtatcggtt ggtgttgaga gattattctc catcatcaag aaccgtgcca atctcaacaa 180
catctccgcc aaccacactg acgtgtttgt tatggcattt ggcggcggcg aaggctggaa 240
cgggttctta aaagaaagaa tggaaatcac caacaagtta tggaaagctg ggatcaacgc 300
cgagtacttg taaaaatcca aagccaacat tcgtaaacaa ttcgatgccg ccgaaaaggc 360
cggcgccaaa ttagctgtca ttcttggtta agaagagtac ccacaaggcc aattacgaat 420
caaagtgttg ggccaggag aggaaaacga aggtgagttg gtcaccaaag atgaactact 480
tgctgctgtc caggccaagc tcagctctga catcgacgac atttctcgca taatcaagg 539

<210> 261
<211> 1030
<212> DNA
<213> Candida albicans

<400> 261
gctaccactc caaacacttc tgttccaaca acttcttcag aatcaactac tccagctact 60
agcccagaaa gttctgttcc agttacttct ggatcatcta ttttagctac cacttcagaa 120
tcatcatctg ctccagctac tactccaaat acatctgttc caaccactac tactgaaacc 180
aaatcatcaa gtactccatt aactactact actgaacatg atacaactgt tgtcactgtt 240
acttcatgtt ctaacagtgt ttgtaccgaa agtgaagtta ctactgggtg tattgtcatc 300
acatctaaag atactattta caccacttac tgtccattga ctgaaactac tccagtttct 360
actgctccag ccactgaaac accaactggg acagtatcca cttctactga acaatcaact 420
actgttatta ctgttacttc atgttctgaa agctcttgta ccgaatctga agttactact 480
gggtgtgttg ttgttacttc tgaggaaact gtctacacta cattctgtcc attgactgaa 540
aacactccag gtactgattc aactccagaa gcttccattc cacctatgga aacaattcct 600
gctggttcag aatcatccat gcctgccggg gaaacctctc cagctgttcc aaaatcagat 660
gttccagcta ctgaatcagc tccagttcct gaaatgactc cagctgggtc acaaccatct 720
attcctgccg gtgaaacctc tccagctgtt ccaaaatcag atgttccagc tactgaatct 780
gctcctgctc ctgaaatgac tccagctggg actgaaacta aaccagctgc tccaaaatca 840
tcagctcctg ccactgaacc ttccccagtt gctccaggta ctgaatccgc accagctggg 900

ccaggtgctt cttcttctcc aaaatcttct gttttggcta gtgaaacctc accaattgct 960
 ccaggtgctg aaaccgctcc agctggctca agtgggtgcta ttactattcc ggaatctagt 1020
 gctgtcgtct 1030

<210> 262
 <211> 528
 <212> DNA
 <213> Candida albicans

<400> 262
 ttggtgggtt agaagttgag aaaggtgctt ctttatttat taagctggac aatgggtcctg 60
 tcttagctct taatgtcgtt ttatcaactt tagttagacc agttataaat aatgggtgtta 120
 tttcattaaa ttctaaatct tctacaagtt tttcaaattt tgacattggt ggatcttcat 180
 tcactaataa tgggtgaaatt tatcttgatt cttcgggtct tgttaaaagt acagcctatc 240
 tttatgcacg tgaatggact aataatgggt taattgttgc ttatcaaaat caaaaagctg 300
 ctggtaatat tgcttttgggt actgcttata aaaccatcac taataatggc caaatttggt 360
 tgcgtcatca agactttggt ccagctacaa aaatcaaagg tactgggtgt gttactgctg 420
 atgaagacac atggattaaa cttggtaata ctattttatc agttgaacct actcataatt 480
 tttacttgaa agatagtaaa tcgtctttga ttgttcatgc tgtttcaa 528

<210> 263
 <211> 528
 <212> DNA
 <213> Candida albicans

<400> 263
 caagagaaag ggaaagaaga gaaaaaggac acagcctttc aaacatcttt tgatagaaat 60
 tttgatcttg ataattcaat cgatatacaa caaacaattc aacatcagca acaacagcca 120
 caacaacaac aacaactctc acaaaccgac aataatttaa ttgatgaatt ttcttttcaa 180
 acaccgatga cttcgacttt agacctaacc aagcaaaatc caactgtgga caaagtgaat 240
 gaaaatcatg caccaactta tataaatacc tcccccaaca aatcaataat gaaaaaggca 300
 actcctaaag cgtcacctaa aaaagttgca tttactgtaa ctaatcccga aattcatcat 360
 tatccagata atagagtcga ggaagaagat caaagtcaac aaaaagaaga ttcagttgag 420
 ccacccttaa tacaacatca atggaaagat ctttctcaat tcaattattc tgatgaagat 480
 acaaatgctt cagttccacc aacaccacca cttcatacga cgaaacct 528

<210> 264
<211> 360
<212> DNA
<213> Candida albicans

<400> 264
cgttaactca gtcataact acattttatt cctttttgca tcaacaatcc ttgcggcaga 60
taaaacgtcc agttcagtat cacctacttt agtatgggtc acagggtactg atgccaatgg 120
gaaattagcc accacccaat caacatatta tcaaagcttt atgagtactt ataccacagc 180
tgaaacccca tcgtctgggt ctattggatt ggggtcaatc agtggaacag taggagaaat 240
cagaacttat agtatgacta ctatatcaca aggtaatggg gggttatcaa aattcaatca 300
aatgggttta gaaatgaaga atttgtcatt tggttaaatta attgggggttt cttttattgc 360

<210> 265
<211> 701
<212> DNA
<213> Candida albicans

<400> 265
gatccagatg ctgtaaccac agccaatgga acattaaatt tacgtatgga tgcttataaa 60
aatcataatt tattctatcg ttcaggaatg gtacaaagtt ggaatcaatt gtgttatact 120
caagggtcatt tagaaattct ggctcgttta ccaaattatg gtaatgtaac aggggttatgg 180
cctgggttat ggtctatggg gaatttaggt agaccagggt atttgggatc tactgatggg 240
gtatggccat attcttacga ttcattgtgat gccggtatta cacctaatac atcttctcct 300
gatgggattt cttatttacc aggtcaaaga ttaaataaat gtacatgtcc aggtgaatta 360
catcctaata gaggtgttgg tagaggtgcc cctgaaattg atgttattga aggtgaagtg 420
atgactgata gtagtggtta aaaagaaaat tgtgggtgtg cctctcaatc cttacaattg 480
gcccctatgg atatttggtt tattcctgat tataattggg tggaaatcta caatttttca 540
gtttcaacga tgaatactta tactgggtgga ccattccaac aagcattatc agcaacaacc 600
atgttgaatg ttacatggta tgaatttggg gataatgcc ataatttcca aacttatggg 660
tatgaatatt taaatgaccc tgaaacgggt tatttacgat g 701

<210> 266
<211> 794
<212> DNA
<213> Candida albicans

<400> 266
 taatttcctt tgttgtttcc ataataagat gtgttggtgc agatgttgac atcacatcac 60
 caaagagtgg agaaactttt tctggtagtt ctggatcagc aagtatcaag attacctggg 120
 atgattcaga cgattcagac tcaccgaaat ctttgataa tgccaaaggg tacacaattt 180
 ctttatgtac tggacctact tcagatgggg atatccagtg tttggatcca ttagtcaaga 240
 acgaagctat tgcaggtaaa tctaaaacag tttctattcc ccagaactca gtacctaatg 300
 gttattacta tttccaaatt tacgttactt tctaataagg aggtaccact attcattatt 360
 caccacgttt caaattgact ggtatgtctg gtccaactgc cacttttagat gtcaccgaaa 420
 caggatcggg gccagcggat caagcttcag gatttgatac tgcaactact gccgactcca 480
 aatctttcac agttccatat accctacaaa caggaagac cagatacgca ccaatgcaaa 540
 tgcaaccagg taccaaagtg actgctacaa cctggagtat gaagttccca actagtgtg 600
 ttacttacta ctcaacaaag gctggcacac caaatgtggc ctctactatt accccagggt 660
 ggagttatac tgctgaatct gccgttaact atgctagtgt tgctccatat ccaacatact 720
 ggtatcctgc cagtgaacga gtgagtaagg ctacaattag tgctgctaca aagagaagaa 780
 gatggttgga ttga 794

<210> 267
 <211> 654
 <212> DNA
 <213> Candida albicans

<400> 267
 acattcattg ggttcatctc cagaaaacaa taatgccctg ggtccattaa gtggagttcc 60
 aactccatca ttttctaatt tgaatgatta tttccaacaa aaaagtaaca gcaataattc 120
 tcgattatth aatgctagtt catcatcatt gagttcatta agtggaaaaa taagatcttc 180
 ttcatcgact aatttagctg gtttacaag attaactcca ttaactagta ctacaaacaa 240
 tacaacaaac acaacaacat ctaatactaa taataataat atgacaaaac caagtataat 300
 accaaaacaa ccattcttcta catcattaaa tttagaattt tataatggca acaatcaaca 360
 acaacagaat tatcatacc ataagaaatc tcgaccaaatt tcaccatcac aaacccaat 420
 tcatttatca agttcacgta aaagcgctaa taatctgttt ataatatcac ctaatgaaac 480
 cccattacaa actccattac aatcaccaca attaaaacca tatcaagatc aaccaccaac 540
 taatgtcaat atcaacgtta gtgcaccatc agatacattt attggaactg ctgttactga 600

aaaattaaat aatattagta gtattgctgg taatggaaca caattaccac caat 654

<210> 268
<211> 529
<212> DNA
<213> Candida albicans

<400> 268
tgtcccagaa agtgctaaac acattttcaa ccaagaaact ttagcatttg ttgccacttt 60
gcaccgtggt ttcgaagcca gaagacaaga attggtgaac aacagaaagg aacaacaaaa 120
attaagagat caaggtttct tgccagatct cttaccagaa actgaatata ttagaaatga 180
tgctacctgg actggtccac cattggctcc aggttttagtt gacagaagat gtgaaatcac 240
tggtccaacc gacagaaaaa tggttatcaa tgccttgaac tccaatgttg ctacttatat 300
ggccgatttt gaagattcat tgaccccagc ttggaaaaac ttggttgaag gtcaagtcaa 360
tctttacgat ggtgtcagaa gaaacttgac tgctaacatt aatggtaaaa attatgcctt 420
gaacttggac aaaggtagac acattccaac gttgattgtg agaccaagag gatggcattt 480
ggatgaaaag catgtattgg ttgacggtaa accagtttcc ggtgggtatt 529

<210> 269
<211> 647
<212> DNA
<213> Candida albicans

<400> 269
ttagctcatc aacatcatca acataaagaa gaaaaaagag ctgttcatgt tgttaccacc 60
accaatgttg ttgttgtcac cattggtaat ggtgatcaaa ctaccacttt tgctgctcca 120
tctgtagctg ctgattctag tgttagtgtt tctgtcaaca ctgaaccacc tcaaaatcac 180
ccaactacta ctcaagatgt tgcttctgct tctacttata catcttccac tgatggttct 240
gccgcttctt cttctgctgc cgcttcttct tcttctcaag ctggttctga accttctggt 300
ggtgttggat ctggtgggtgc taaagggtatt acttattctc catacagtga caatgggtgga 360
tgtaaatcat catctcaaat tgccagtga attgctcaat tatctggatt taatgtcatt 420
cgtttatacg gggttgattg tgatcaagtt gcagctgtat taatagctaa aacttcatct 480
caaaaaattt tcgctgggtat ttctgatgtt tctagtatta catctgggtat tgaaagttaa 540
gctgaagccg ttaaaagtat ttgcggtagt tgggatgata ttacactgt ctctattggt 600
aatgaattgg ttaatgctgg ttctgccact ccaagtcaaa ttaaagc 647

<210> 270
<211> 636
<212> DNA
<213> Candida albicans

<400> 270
actgtcgttt ctggtcattc tggtaaagat acttcctctt ctaaatacaac tgttgccgaa 60
tacactgggg ttgaagaaat cactaccacc ttgaattatg actatttagt tgttggtggt 120
ggtgctcaac catctacttt cggatattcct ggagtcgctg agaattcaac ctttttgaaa 180
gaagtcagtg atgcttctgc tattagaaga aaattgatgg atgttattga agctgccaat 240
attttaccta aagatgaccc agaaagaaag agattattgt ccattgttgt ttgtggaggt 300
ggaccaacgg gtgttgaagc tgctggtgaa atccaagatt atattgacca agatttgaag 360
aaatggggttc ctgaagttgc cgatgaattg aaagtctcct tggtggaagc tttaccaaac 420
gttttgaaca catttaacaa gaaattgatt gactatacca aagaagtttt caaagacact 480
aatatcaatt tgatgactaa taccatgata aaaaaagtca atgataaaag tttgattgca 540
aaccataaaa accctgacgg atctactgag tctattgaaa ttccatatgg tcttttaatt 600
tgggctactg gtaatgcacc aagagatttc actcgt 636

<210> 271
<211> 666
<212> DNA
<213> Candida albicans

<400> 271
ggtacgaaca gacaaacacc tgaagaaact gacattggta tgattgccca ttattttgaa 60
aaataccagt ttgacgggtt aattattggt ggaggttttg aagcatttgt ttcgttagag 120
caattggaaa gatcaagagc tatgtatcca tcgttcagaa ttctatggt tttaatccct 180
gccaccattt caaataatgt tcctggtacc gaatattcct taggggctga tacctgtttg 240
aattcgttta tggaatattg tgacattgtc aagcaatcag cttcagctac cagaggtaca 300
gcatttatta ttgatgttca aggaggtaat tccggatata ttgccacatt tgcctcatta 360
atcagtggag cacaagcatc ctatgttcca gaagaaggta tttcattaca gcaattggaa 420
atggatatca attcattgag agaagcattt gccgtggaac aaggaatgac aaagagtggg 480
aaattgatca tcaagtcgag taatgcattc aaagtactaa cccacacac attggctgac 540
atattcaacg atgaatgtca cggtgacttt gacactaaga cagctattcc gggacacgtc 600

caacaagggtg gattaccttc accaatagat agaagcagag gtgatagatt tgccattaga 660
gctggtt 666

<210> 272
<211> 588
<212> DNA
<213> Candida albicans

<400> 272
ttagccaagt ttgaatcgtc cccccacca gttgaagttg ttggttaacaa atttttatttt 60
tccaataatg ggtctcagtt tttaatcagg ggtatcgctt atcagcaaga tgccgcgggc 120
tcagtttcct ccggttacga cgccgatcct aatagaaaat acaatgatcc tttagccgat 180
gctgacgctt gtaaacgtga cgtcaagtat ttcaaagaat caaacaccaa tactttgaga 240
gtttatgcta ttgaccaga taaggatcat gaagagtgtg tgaaaatttt cagtgacgct 300
ggtattttaca ttgttgctga tttatcagaa ccaactgtat cgattaacag aaacaacca 360
gaatggaact tggattttata caaacgttat acaaaagtca ttgataagat gcaagaatat 420
tctaattgttt tgggattttt tgctggtaac gaagtaacta ataatcgctt aaataccgat 480
gcttctgcat ttgttaaggc tgccattaga gatatgaaga aatacatcaa ggagtctgat 540
tatagacaaa ttctgttggt ttattcatcc aatgatgacg aagaaatt 588

<210> 273
<211> 609
<212> DNA
<213> Candida albicans

<400> 273
tcaatcttgg ctgctacttc attcgtttct tccgtggctg ccgaagattt gcctgctatt 60
gaaattggtg gtaacaaatt cttctactcc aacaatggat cccaatttta catcaaagg 120
attgcttacc aacaaaataa cttggactcc aacgaatcat ttgttgacct attagctaat 180
cctgagcact gtaaaagaga tattccatac ttggaagctg tcgactacga ctccaatgtc 240
atcagagttt atgctttaga caccagtcaa gaccatactg aatgtatgca aatgttgcaa 300
gatgccggta tttatgtcat tgccgatttg tccaaccag atgaatccat caacagagac 360
gacccatcct gggatttgga tctttttgaa agatacactt ctgttgctga tttgttccac 420
aactacacta acatttttagg tttctttgcc ggtaatgaag tcaccaacaa gaaatcaaac 480
actgacgctt ctgctttcgt taaggctgct atcagagata ccaaagccta catcaaaagc 540

aaagggttaca gaagtattcc agtcgggttac tctgccaatg atgattccgc catcagagtt 600
tcattagcc 609

<210> 274
<211> 684
<212> DNA
<213> Candida albicans

<400> 274
attgggtatc aacaccattc gtattttattc aataaatgca cacctaaacc acgataaatg 60
catgaccatg ttggccaaag caggaatata cttgttttcta gacgtaaact cgccattgcc 120
acaccaccac ctaaaccgat acgagccgtg gaattcgtac aacttgtact actttgaaaa 180
tgtctttaag gtggtagaac agttttccca ctacaacaac acgctagggt ttattgccgg 240
gaacgaaatt gtcaacgacc ccatctccgc cagtgtggct gccccatatg tcaaagcgg 300
ggtccgcgaa atcaaaagct atatcgaata caatgcacca agaaccatcc ccgtcggtta 360
ttcagcggcc gacgacttga actatcgaat gccactagca cagtacctcg agtgtggcga 420
cgacaacccc aaagaatcag tcgactttta tggcgtcaac tcgtaccagt ggtgtggcga 480
ccagacattc tacagcagcg ggtacaacat cttggtcaac gattacaaac atttcaccaa 540
accaatgttt ttttcggaat atgggtgcaa tgaggtgttg ccgagaaatt tcgatgaagt 600
cccagtattg tacacaaacg atatgataga tgttttcagt ggcggattgg tatacgagtt 660
caccagga ccaaacaact atgg 684

<210> 275
<211> 532
<212> DNA
<213> Candida albicans

<400> 275
attagctgaa catgccagag accacacatt gagattcggg agcaaatcgc catttttcag 60
aaaatacttt ggaaatgaca ctgcaagtgc tgaggtcgtt ggtcattttg aaaatgttgt 120
cgggtgctgac aaatcatcca ttttgtttct ttgtgatgac ttagatgata agtgcaaaaa 180
tgatggctgg gctggctatt ggagagggtc caaccatagt gatcaaacta ttatttgtga 240
cttatctttt gttaccagaa gatacttatt ccaactatgc tccggtggat ataccgtctc 300
gaaatctaag acaaacattt tttgggcagg tgacttggtta cacagattct ggcacttgaa 360
atcgattggg caacttggtta ttgaacatta cgctgacact tatgaggagg ttcttgaatt 420

ggctcaagaa aattcaactt atgctgtaag aaactcaaac tcattgattt attatgcttt 480
ggatgtgtat gcatatgatg tgacaattcc cggcgaaggg tgcaatggag at 532

<210> 276
<211> 506
<212> DNA
<213> Candida albicans

<400> 276
gatttacacg cctcaciaaat tcaagggttt ttogatgttc cagtagataa cttgtacgct 60
gaacctagtg tggttagata catcaaggaa actattgatt atagtgaagc tataattata 120
tcttctgatg ctgggtggtgc caagagagct gctggattgg ccgatagact tgatttgaat 180
tttgaattga ttcataaaga aagagccaga gctaataaag tatctcgaat ggttttagtt 240
gttgatgtca ccgataagat ttgtgttatt gttgatgata tggcggatac ttgtggtact 300
ttggctaaag ctgccgaagt attgttagat aataatgcta aagatgtcat tgccattgtc 360
actcatggta tattatctgg gaacgcaata aaaaatatca acaattctaa attgaaaaaa 420
gttgatgtga ccaacaccgt tccatttgaa gacaaattga aactttgtct taaattggat 480
acaattgata tttctgctgt tattgc 506

<210> 277
<211> 606
<212> DNA
<213> Candida albicans

<400> 277
taccacgata gctccatttc ccttagtggt tccaagaaca agagagaagc tgaaattgtc 60
aatgaagatg gtacaattga aaagagaact tttggaagcg ctgggtgtaaa tgccgggttc 120
aatgccgcat ttgtcgtgtc taatgccaaa aaattatctg acggttctta tggattgat 180
tgtaacttca agagtgattc ttctgtccaa ttgaacctgg cctttggtaa aaaagttaaa 240
caattgagta tcaccggtac tggttattct gatatttcat tattaggaaa tgttgctaata 300
ccatttgaat ggtcagcttc cttgaaagtc aaagcagaaa ttgttaaagg aaaatgttgt 360
cttccatcag gtttcagaat cgttacagat ttcgaaagca actgtcctga atttgatgcc 420
atcaaacaat tttttggcag ttctcaaata atttacaag tcaatgccgt ttctaacgca 480
attggtactt ttgatgcttc tgcattattc aatgctcaag tcaaagcctt ccctgccaaag 540
agagaattag atgaatttga agaattaagt aacgatggtg ttactcacag caagagaact 600

ttgggt

606

<210> 278

<211> 625

<212> DNA

<213> Candida albicans

<400> 278

gtgggtgttac tgttggtgaa actgccaccg ttgctacaac tgttaccgtt ggtgcaactg 60

tcactggtgg tgaccaaggt caagatcaag ttcaacaatc agctgctcca gaagctggtg 120

atattcaaca atcagctggt ccagaagctg atgatatacca acaatcagct gttccagaag 180

ctgaaccac tgccgatgct gatggtggta atggtattgc aattaccgaa gtctttacca 240

ctaccattat ggggtcaagag attgtttatt ccggtgttta ttacagttat ggtgaagaac 300

atacctatgg agacgttcaa gttcaaacc cactatttgg ggggtggcggc ttccttcag 360

atgaccaata tcctacaact gaagtttctg ctgaggctag tccatctgct gttactactt 420

cttctgctgt tgctactcct gacgccaaag tcccagactc tactaaagac gcttctcaac 480

ccgctgctac tacagctagt ggctcctctt ctggtagtaa tgactttagt ggtgttaaag 540

atacccaatt tgctcaacaa atcttggatg ctcaacaacaaa aaacgtgct agacatggtg 600

ttccagattt gacttgggat gctac 625

<210> 279

<211> 220

<212> DNA

<213> Candida albicans

<400> 279

aagagatgat cctcatacta ttgaagcctt gagacaacaa caacaacaac cagtctcaac 60

ttctgaaggt caacaagttg ctcaaagaat tgggtgctgct gattacttgg aatgttctgc 120

taaaaccggt agaggtgtta gagaagtgtt tgaagctgct actagagctt ctttaagagt 180

taaagaaaag aaggaaaaga agaagaaatg tgttgtcttg 220

<210> 280

<211> 531

<212> DNA

<213> Candida albicans

<400> 280

taagagagat ggccgtaaag agccagtacg ttctgacaaa atcactgcca gagttcaaag 60

attatgttac ggtttgaatc caaaccacgt tgaaccagtt gctattaccc aaaaagttat 120

atcaggtggt taccaggggg ttactactat tgagttggac aacttggctg cagaaattgc 180
tgctacaatg acaacaattc acccagatta cgctgtctta gccgctagaa ttgccgtatc 240
aaatttacat aagcaaacca ccaaacagta ttccaaagtg tctaaggatt tatatgaata 300
cattaatcct aagactgggt tacactctcc tatgatttcc aaggaaacct acgacatcat 360
tatggaacac gaagatgaat taaactcagc cattgtttac gacagagatt ttaactacaa 420
ttattttggg ttcaagactt tggaaagatc atatttggtta cgtatcaacg gtaagggtgc 480
tgaaagacca caacatttga tcatgagggt tgctgtcggg attcacggta a 531

<210> 281
<211> 453
<212> DNA
<213> Candida albicans

<400> 281
ttttggacct caaatggacc agtatgtgag agaaaaacta ttaagtgatg tggaaggtag 60
atgtacaggt caatttggtt acattgtgtg tgttttggat tcaatgaata tagatgttgg 120
caagggaaga ataattccaa gtactgggat ggctgaattt gaagtcaaat atagagctgt 180
tgtgtggaaa ccattcaaag gtgaagtggg agatgcagtt gtaacaaccg tcaataaaat 240
gggatttttc gccgatgttg gccattatc agtgtttggt agtaccatt tgataccttc 300
agatatgaaa tttaatcctt cagcaaacc accagcatat gtgagtcccg atgaaaacat 360
tgaaaagggg tcgagggtta gattgaagat tgttggtaca agaactgatg tcaatgagat 420
ttacgccata ggaagcataa aagaagacta ttt 453

<210> 282
<211> 525
<212> DNA
<213> Candida albicans

<400> 282
ccaagaactt accattattg aacaaccact tcagaaagca ctggcaagaa agagtcagag 60
ttcactttga ccaagctggg aaaaaagctt caagaagaca atctagattg agaaaagctg 120
ccaagattgc cccaagacca atcgatgctt taagaccagt cgtcagagct ccaactgtca 180
aatacaacag aaaagtcaga gccggtagag gtttcacttt ggccgaattg aaagccgttg 240
gtattgctcc aaaatacgcc agaaccattg gtatctcagt tgaccacaga agacaaaaca 300
aatctcaaga aacttttgat gctaacgtcg ccagattaca agaatacaaa tctaaattag 360

ttatctttga caaaaagacc aaggcttctg aagttgcttc tttcgaacaa gttgatgtct 420
ctgccacctt cccagttgaa caaccagctc cagaatctgg tttgagagct gttgaagtcc 480
cagaacaaac tgcttacaga accttgagat tggctagaaa cgaaa 525

<210> 283
<211> 400
<212> DNA
<213> Candida albicans

<400> 283
ttaaaggatt caaaaagggt gtccttaggg cccacagac aatgcgtcag aaattcaaca 60
tgggagaaat cacccaagat gctgtttatc tcgatgctga aagaagattc aaagaaatcg 120
aaacggaaac aaaaaagttg agtgaagaat ccaagaaata tttcaatgct gtcaatggga 180
tgttagatga acaaattgat tttgccaaag ccgtggctga gatttataaa ccaatcagtg 240
gtagattatc ggaccccagt gctacggtac cagaagataa cccacaaggt attgaagcat 300
cggaactgta ccaagcagtg gttaaagatc tcaaagatac cttaaaaccc gatttggaat 360
tgattgaaaa aagaattggt gaaccagcac aagaattatt 400

<210> 284
<211> 522
<212> DNA
<213> Candida albicans

<400> 284
catggcacca gaaagaacca ccaattataa caccatcgt ttaatcaacc aattaattga 60
tatgaatcaa tatgagtcaa ttgaaatcaa tgggacaaca gtgacaaaat caaactgtaa 120
atatttacct acattggctg gggatatttg gtcattggga gtattgttca ttaatatcac 180
ttgttcaaga aacccatggc ccattgcac atttgataat aatcaaaata atgaagtgtt 240
taagaattat atgttgaata ataacaaggc tgttttgagc aaaatcttac ccatttcctc 300
acaatttaat cgcttattag atagaatttt caaattgaat cctaatagata gaatagattt 360
accaacttta tacaagaag ttattcggtg tgatttcttc aaagatgatc attactacta 420
tgccaacat caacatcac acaatcacia tcaaatcaat aatgcttaca atcactatca 480
gaaacaacct aatcaagcaa gacctactgc aaaccaacaa tt 522

<210> 285
<211> 500

<212> DNA

<213> Candida albicans

<400> 285

```
tataatgccc cgaaaataaa gtttaccgat actgaaggac aagaagaaca tttttatttc      60
aatcggagta acaattcaac caatgattta accagtcatg actcttcac c aactcaacta      120
caagatgcca attccagaag acaagcccca ccaccaccac cacataatcc attttctgac      180
aattcccatg aaaatagtac tgaatcatta tatcaatcag aaacaagatt tcatcaacca      240
ctacttcata atgatagtaa taatagcaat agcagtatag gcaataatag acaacgtatt      300
ccatcacaac aacatgatac actgtcatta tattcagcat caccaatata aacatcacct      360
ttagtttcta attttcaatc atatctggac aaccaagacg aaatgactcg aggtaagtat      420
aaccagaata caaatcggtc aagttcaaata tatattcaac acagtccaac atcagcaggg      480
tacgatagat atccgcttaa                                         500
```

<210> 286

<211> 279

<212> DNA

<213> Candida albicans

<400> 286

```
tggaacctgt ttgtacttga cgtcattgtc gaaaaaacac ccagagaaat tgtgtaaaga      60
gaaatacgtc cacggcggta acgtgttgat cgacccaact gccaaagatcc acccatctgc      120
cttaatcggg ccaaacgtca ccatcggtcc aaacgttggt gtcgggtgaag gtgctagaat      180
ccgaagatca gtgttggttg ccaactccca agtcaaagac cagcctggg tcaaactctac      240
cattgttggt tggaactcca gaattggaaa gtgggctag                                         279
```

<210> 287

<211> 597

<212> DNA

<213> Candida albicans

<400> 287

```
gatttcctag ccggaatgca cgacaatcct gagacggaag tcgatcgtcg atgccccatgg      60
tgcggtggtga aaaattttct tagaaaattt gttctttcct tcaactgctt ttaagaaaga      120
gaggttcaag tggtttaagt acgacggtca caaagattgc ggcttatgag gcccgaaactg      180
agttgaaata caaatcaag atataattat ataccttact tgtccatatt gttttataat      240
acattcttca gatattttaa tttctgtgta tcaacctata aaacagagat acattcagtg      300
```

catttagtat actgagtga ctggtacctg tgacattcaa gataactgtt tcgcgcacgc 360
tggcagacga acagattaga agcttggtaa agttctgctt tgctcaatag gtttcagatt 420
cagaaagatt gttaaaactt agatcatctt cgttcatcac aaaccaagaa ctttacggaa 480
tgtacgaata tcactttcat tagtagataa ttcgttactt aatccagtga ttaatcttga 540
ggttcgaaag atggttaata gaaatttatt tgacaattac gactaagggt acataat 597

<210> 288
<211> 350
<212> DNA
<213> Candida albicans

<400> 288
aagacgactg agcgtgtccc ttttgtataa actttataat tttcaatgaa tcttttacct 60
cattgggttc aacaccgcca ctaacatcgt agcccaaat gttgtcaa gtaggcaa 120
tctcaggggt tagccacca gcaagtatag cttttgtagg taacttctca ataaacgtcc 180
aatcaagtaa cttcccttca cccccaactt ccgaatcaag caacggcaaa ctcacacatt 240
gcgttaacag caagctctgc tcttccaaaa ggtctagctc gtcaggaaca acatacctgg 300
gaattaacct aaattctgta cccaaaaact ctagcttatt ttccagtcca 350

<210> 289
<211> 330
<212> DNA
<213> Candida albicans

<400> 289
acatgtcaag aggattgttc atgtaagaat aatgaagccc ccacaacaaa gacaactgcc 60
accacaacta atgttggtga tggccctggc cctggcccta tccctggcaa taatgatgat 120
gatgatgatg acatttggtc agatgatgat acgaaactaa tacctgaaaa tgatataata 180
cgatcacatt ataaaaaagg gtatgttgat gggataactc aagctaaaga atcttcatta 240
caacaaggat ttgatgatgg atatcctgaa ggtgcaaaat tagggattaa agttggtgaa 300
attttagcaa atttaataca tcaatgtaaa 330

<210> 290
<211> 524
<212> DNA
<213> Candida albicans

<400> 290
gccgaagata ctaaaccaaa gactgaagaa tcattcttcta ttccaaaacc accaacttct 60

aatgtattct ccatgttttg tgccaaaaaa gagaaaaaac cagaacaaga agattcagac 120
 aacaagaaag aatccgataa aaaggaagaa aaagatacta gcaaatcaac tggatgatgat 180
 aatgaagtag ctgaagaaga agaagctgat gtcgaattta ctccagttgt tcaattggat 240
 aaaaaagttg acgttaaaac caatgaagaa gatgaagaag tcttgtataa agttagagcc 300
 aaattattta gattccatgg tgattcaaaa gaatggaaag aaagaggtag tggatgatggt 360
 aaatttttaa aacataaaac tactggtaaa gttagaattt taatgagaag agataaaact 420
 ttgaaaattt gtgctaatac tttgatttct gctgattatg aattgaaacc aaatattggt 480
 tctgatagat cttgggttta tactgttact gctgatgttt ctga 524

<210> 291
 <211> 513
 <212> DNA
 <213> Candida albicans

<400> 291
 tctgatgttg ctgtttgttc ttcaagaact ttcggtcaaa gagctgtttt gaaatttgct 60
 gctcacactg gtgctactgc cattgctggt agattcactc caggtaactt taccaattat 120
 atcactcgtt cattcaaaga accaagatta gttgttggtta ctgacccaag aaccgatgct 180
 caagccatca aagaatcatc ttatgttaac attccagtta ttgccttgac tgacatggac 240
 tctccatctg aatacgttga tgttgccatt ccatgtaaca acaaaggtaa acactctatt 300
 ggtttaatct ggtgggttgct tgctagagaa gtcttgagat taagaggtag tatcccagac 360
 agaactaccg aatgggtcagt tatgccagat ttgtacttct acagagaccc agaagaaatt 420
 gaacaaaatg ccgtcgaaga agctaaaact gaagaagttg aagaagctcc agttgctgaa 480
 gctgaaaccg aatggactgg tgaaactgaa gat 513

<210> 292
 <211> 613
 <212> DNA
 <213> Candida albicans

<400> 292
 tcgaccatac catccaatac ttgaatcatt ggaatttcaa accaatcaac atttaattca 60
 agaatattct ttagatattg tcaatacttt atctcaattg gaatcactta cattagttaa 120
 tcttgccatg attgatttac aaccagaaat tcaatgggtt atgcgtccat ttttattaga 180
 ttttttaatt gaattgcatt cttcatttaa attacaacca acaacattat ttttatgtct 240

taatattatt gatagatatt gtgctaaaag aattgttttc aaacgtcatt atcaattagt 300
tggttgtaga gcattatgga ttgctagtaa atatgaagat aaaaaactgc gtgtacccac 360
attaaaagaa ttaacaataa tgtgtcgtaa tgcttatgat gaagaaatgt ttgttcaaatt 420
ggaaatgcat attttaagta ctttagattg gtcaattggc catccaactt tagaagattg 480
tctacaatta gccattgatc tgaataattt atctaacaac accactaatg atattgaaaa 540
caaaagtgtc cgtcctaata ggaaatcaag tatatcatca gctgtaactg ctgttgctag 600
gtttctttgt gaa 613

<210> 293
<211> 251
<212> DNA
<213> Candida albicans

<400> 293
agaaatttgg cctgatgtta attatttacc agatttttaa tcaagtttcc ctcaatggaa 60
aaagaaacct ttgagtgaag cagttccaag tttggatgct aatggaattg atcttttgga 120
tcaaattgtg gtgtatgatc caagtagaag aataagtgtc aaacgagctt taattcatcc 180
ttattttaat gataatgatg atcgtgatca taacaattat aatgaagata atattgggat 240
tgacaaacac c 251

<210> 294
<211> 564
<212> DNA
<213> Candida albicans

<400> 294
aacagcaacc agaaatcaag ttaggtatga gaccattggt gttggatttc ttaatggaag 60
ttatcactat tctcaacttg tctagatcta cattcccttt gactgtcaat ttgattgatc 120
gttattgttc aaccagaatt gtcaagaaac aacattacca gttgttgga ttgactagtc 180
tttggatcag ttgtaagaac ttggattcaa agttcaaagt tcctacattg aatgatttga 240
gaaaaatttg tgttgacagt tattacaaag aattgtttgt ggaaatggag aaacatattt 300
taaaatcatt agaattgggtc gtcaatgctc cgacatttga tgcctttatt gatttgtatt 360
caaacttggt gatttctaac agcagtaact ttgaggttgc aaacattatc aaaaaatcat 420
ctcataaaat aaaattgttt tccaattata ttggtgaatt gttccagttt tatccaaaca 480
tttattacga ttacacatcg tcacaaattg ctttgattgc tattttaatc acggtcttga 540

cgttgaagat tcctgttgat ttaa

564

<210> 295
 <211> 580
 <212> DNA
 <213> Candida albicans

<400> 295
 gctaccactt taaccgacac cgggtgtatcc tcaggattga ataataccac ttctgggtggc 60
 ggcagtgata gtgcaacctc cacacacaac aacaatgagg catcgaccaa accaagtaat 120
 ggcagtgaaa aatcgtcacc ggagtacact acaactgccc gcggtagaga tgagtttgga 180
 ttctttaatg aagccacacc aagtcaatac aaagccaatt cagattatga agacgatttc 240
 ccattggatt atatcaatca gaccactcaa aattctgaag attatattac tttggatgca 300
 aattatcagg caggaagtta tgcaaatatg atcgaagaca attacgattc atttttggat 360
 gcaacactat ttatacctcc aagtcttggc gtacctacag gtacagctgc gactgcaaca 420
 acatcaaacc aagttgcctt caacgacgaa tacttgattg aacaagccca accaataagg 480
 actccactac cccaatatc atcatcaaca atatccgat tattacaacc aaaatcagct 540
 gctaaattct tttcactaca gagtgctaata ggtggagaag 580

<210> 296
 <211> 604
 <212> DNA
 <213> Candida albicans

<400> 296
 tttcatcacc acctcaagtc tctgtaacat catctgaagg agtttcacat gtcaatacac 60
 gtcaatattt ggggtgatggt tcaaatacat acataacaaa tgctaaacca acaaataaaa 120
 gaaaaccatt ggggtggagac aatgcccctc tacaaaaaca acagcataga ccatctagac 180
 caatacccat tgccagtgat aacaacaata atggtagtac cagtagcagt agcaacagta 240
 gcaacaacaa taacaacgac gcaaataagac tagcatcttt ggcagttcca tctcgattac 300
 cccaaaaacg acaagctact gaatcgtcga caaatttagt agagaaatta agagtaccac 360
 aaccagaagt aggggaaaga agtcagtcac accataagaa atcacgttta attgattatg 420
 aatggcagga tttggatgaa gaagataatg acgaccaatt aatgggttagt gaatatgtta 480
 acgaaatatt ttcgtactat tacgaattag aaacacgaat gttacctgat ccgcaatatc 540
 ttttcaaaca aacattgtta aaaccaagaa tgagatcgat attgggttgat tggcttgttg 600

aat

604

<210> 297
<211> 735
<212> DNA
<213> Candida albicans

<400> 297
ccagcaaaca attcctaate aattgtcaca gccacaacct cagcattaca atggatctaa 60
tcgtaattac acaagtgtct ctagtggtgc cccataacct tccaattcta ccagtggacc 120
ttcacaacag ccaccactac caggtcaaca agcagtacct atcccaccac atgtatcgac 180
aatgcaacaa ccaactcctg ttcaggatac gttgaacgcc tcgagcactt ccactgtggg 240
gcaattccaa ccaccaggaa tcagaccacg agtaacaact accatgtggg aagatgaaaa 300
aactttgtgc tatcaagttg atgccataa tgtgtcgggt gtcagaagag cagataataa 360
tatgatcaac ggaaccaaatt tgctcaatgt ggcccaaatt acacgtggta gaagagatgg 420
gattttgaaa tcagaaaagg tgagacacgt tgtgaaaatc ggatcaatgc atttgaaagg 480
agtctggatt ccatttgaaa gagcattggc catggctcaa cgtgaacaaa ttgtggatat 540
gttgatctct ttgtttgtca gagatattaa acgagtgatt caaacggag taactcctaa 600
tgcagctgct gcaacggccg ccgccgctgc cactgccact tctgcttcgg ctctccacc 660
tccacctcca cccgttgctg ctgtactac tactgctgct actgctattt ccaaaagttc 720
tagcggtaat gggaa 735

<210> 298
<211> 563
<212> DNA
<213> Candida albicans

<400> 298
gctcgtttga ttagatttgg gatctttgcc cttgttttaa taggatgtgg ctatatcctt 60
acaagaggct catcattcca acctccaaat tatcaacaaa cacaatcacc cgccgctcat 120
gaaaaacaga ccggtaatgt tgctgctgga ggtgggtgctg gttcagggtc cgcaggagct 180
caagttccat taggcaaaaa tagaggtcca ataccaaaag caattatggg agctggtgaa 240
ggtggtagtg atgctccggt tcctcaacaa gatattcctg atagttatac cctcaatgac 300
aaaattaagg ctacatttgt cactttggcc cgtaactctg atttatattc tttagctgaa 360
tcaattagac acgttgaaga tcgtttcaat aagaaattcc attatgattg ggttttcctc 420

aatgatgaag aattcaatga tgaatttaaa gaaactggtg gtagtttagt tagtggtaac 480
actaaatttg gtttgattcc aaaggaacat tggtcatatc ctccatggat tgatcaagaa 540
aaagctgctt tagtccgtga aca 563

<210> 299
<211> 554
<212> DNA
<213> Candida albicans

<400> 299
cccaactaat tcagcatcac ttaaacagaa acaacgtcaa cagctaggaa ttaaatecca 60
gattggtgct tcaacatcag acgtatatga tccccaagtt gctagttatt tgagtgtggt 120
tgattcacct agccaatttg ccaacactgc ctttcacatc agtaatagtg ttggttattc 180
tgctagtgca gctgcagctg ctgcggaatt acaacaccgt gcagaattac aaagaaggca 240
acaacaattg caacaacaag aattacaaca tcaacaggaa cagttacaac aatatcgaca 300
ggctcaagca caggctcaag cccaggcgca agctcaaaga gaacaccaac agttacagca 360
tgcttatcaa cagcaacaac agctacacca attgggtcaa ctttctcaac agttggcaca 420
accacatttg tcacaacatg agcatgtcag agatgcgctc actacggatg aatttgatac 480
taatgaagat cttcgttcac gatacattga gaatgagatt gtaaagacat ttaacagtaa 540
agccgaattg gtac 554

<210> 300
<211> 503
<212> DNA
<213> Candida albicans

<400> 300
aacagcaagc tgctcagttg cagcaacaaa tgcaacagca attgcaagcc agtggggtgc 60
caacaacacc aaactattct gaattgtagt gtcaattagg ccagttgtct caacaacaat 120
cacagcaaca gcagcttcac catatacctc aacaacgtca acgaaccagc agtcaacaac 180
tgcaacagca acctcaaca actgcacatg gattggatca accagatgct gcagttattg 240
ctgcaattga agctagtgca gcagcagctg ttgcgtctca aggatcacct aatgtcactg 300
cagctgctgt agccgcatta caacacacac agggtaatga gcacgatgct caacaacaac 360
aagatcgtgg tggtataaac ggtgggtgcta ttgattcaaa tgatgatcca agtcttgacc 420
caaacgttga ccctaattgt caagctcatg atcattctca tggattaaga aattcgtatg 480

ggaaaagaag tgggtttttg taa

503

<210> 301
<211> 724
<212> DNA
<213> Candida albicans

<400> 301
gtcctttcaa gtgtttgtgg agcaactgta acattatattt cgagactcca gaaattttgt 60
acgatcattt gtgtgacgac catgttggta gaaagtcttc gaacaatttg tcattgactt 120
gtctttggga aaattgtggc acaactacag ttaagagaga tcacattact tctcacttga 180
gagtccatgt cccattgaag cctttccatt gtgacttggtg tcccaaactg ttcaagagac 240
ctcaagattt gaagaaacat tccaagactc acgctgaaga ccatccaaag aagttaaaaa 300
aggcacaaag agagttgatg aaacaacaac aaaaagaggc caagcaacaa cagaaattgg 360
ccaacaagcg agcaaactcg atgaatgcaa ctaccgcacg cgatttgcaa ttgaactact 420
attccggtaa ccctgctgat ggattgaact acgacgacac ctccagaaaa agaagatacg 480
aaaacaattc tcaacacaac atgtatgtgg ttaatagtat tttgaacgat ttcaacttcc 540
aacaatggc acaagctcca cagcaaccag gcgttggttg aaccgcagg ttctggctga 600
gttcaccac caagaggatg aaagccggca ctgagtataa cattgatgtg tttaacaagt 660
tgaatcattt ggacgaccac ttgcaccacc accaccctca acagcaacac ccacaacaac 720
aata 724

<210> 302
<211> 543
<212> DNA
<213> Candida albicans

<400> 302
ataaccaca taaggctctg ttaccaggag aagaaatctc aggacaagtt gtattaattt 60
cgaaaaagaa tttggcaaat atagtcataa cgttgtcgtt ggtgggggtt attaaaataa 120
atgcacgctc acatctgaag ttgaggcctt tgaagcatac gttatttgat tatactatta 180
aatctatgg taaagatgaa gaagaacaaa cagactcagc agagtttagt aatggacttt 240
tgaaaggcga acatgtgttt ccgtttattg taaagttgcc caataaaaga gtatatacgt 300
cgattgattt tgggaaagg tccatcaact acattttgaa agcagctata ggaaactcgt 360
cgtcctatgt gatacctgcc tcgcccgaac atgccagtac tagcagttta acgaaaaaga 420

aaatactaca gaatcctagt cacacatcag aaaaagtcac aagtctagta aatccaatag 480
atgttttcggt attgcctcga ccgaaaccaa agagattgat tctcaaagat ccacgaacta 540
gct 543

<210> 303
<211> 315
<212> DNA
<213> Candida albicans

<400> 303
tgactacgat gactactgaa gaaatattgg cttcttatcc acaaatcacc gctccaaccg 60
atcaaacagg ttacacatca aatttaacac ctgaacaaaa aaccacttta gatataattca 120
gacaacaatt aactgaattg gggtataaag acagattaga tgatgcatca cttttaagat 180
ttcttagagc aagaaaattt gatattcaaa aagctattga tatgtttgta gcttggtgaaa 240
aatggagaga agatttttggg gtttaatacca ttttaaaaga tttccattat gaagaaaaac 300
ccattgttgc taaaa 315

<210> 304
<211> 230
<212> DNA
<213> Candida albicans

<400> 304
attggtttca aacagttact cagcacgcca atgaggatgc acagatattt ttagtaggta 60
acaagtgtga tgatgaagta aacagacaag tttctaaaga gcaagggtcaa gaattagctg 120
ctaaattaaa tgttccattt ttggaagcca gtgcaaaaag caatgaaaac gttgactcta 180
ttttttacga attggctagt attatccaag agaagcatgt tgaagagaat 230

<210> 305
<211> 575
<212> DNA
<213> Candida albicans

<400> 305
aaagagctaa ccacgtcaag gaaatcccac cattcttgca agatttagac attgccaaag 60
ccaaccccga gttcaagaaa cagcacctcg aatactatgt gttgtacaac ccagcgttct 120
ccaaagactt ggatattgac atgggtccact ccttagacca ctgcgtcagtt gtttgctgcg 180
tgagattttc cagagacggc aagttcatcg ccaccggttg caacaaaacc acccaagtgt 240

tcaatgtcac caccggagag ttggtcgcca aattgattga cgagtcctcc aacgaaaaca 300
aagacgacaa caccaccgcc tcaggcgact tgtacatcag atctgtgtgt ttctcccctg 360
acggaaaact cttggcgaca ggtgcagaag acaagttgat tagaatctgg gatttgagca 420
caaagagaat tatcaaaatc ttgaggggcc acgaacaaga catttactcg ttagactttt 480
tccctgatgg cgatagggtg gtttcaggct ccggcgatag gtcagtcaga atctgggact 540
tgagaacctc ccagtgttcc ttgactttgt cgatc 575

<210> 306
<211> 286
<212> DNA
<213> Candida albicans

<400> 306
agggtggtgtc atgaaattat tagttggtaa taaggctgat ttgtctgata aaaaaatcgt 60
cgaatatact gctgctaaag aatttgctga tgccttggaac attccatttt tagaaacctc 120
cgctttatca tcgaccaatg ttgaacaagc tttttacact atggcaagac aaatcaaagc 180
ccaaatgaca aacaatgcca atgccggaaa tgctgccaat gccaaaggga aatctaattgt 240
gaatttgaga ggtgaatctt tgacttctaa ccaatcgaat tcctgt 286

<210> 307
<211> 558
<212> DNA
<213> Candida albicans

<400> 307
ttgcccaatc agcattacaa tttgcaacaa agacaacagg cacaaggaca acaactcaaa 60
ctgcaactaa acgagcaaaa tgccatgatg tctgcctcga ctcaacaata tcctgtccag 120
gattttacaa atccttacct caatgcacag aatcccgcag aacaacagca acagcaacaa 180
cctcttcgaa ccagtcaca acaatgggac ggctaccaat ctcaaccttt gtattctgct 240
gctggtaata ctataccatc ctcaatccag cagcaaatac caccacagaa tttgtctcca 300
tcagagcagc aacaagtcaa gcaacaacag ccaactgccgc cagaacaagg aacaaagaaa 360
aaacctggta gaaaaccaaa attaagaaaa ttatcggaac tgagttctga aacaccacaa 420
gttccaaaaa cagcatccag ttcttcgagc tcaccaactg cagtcaattc tggtaaacca 480
attacaaaaa gatcgcgtat gggatgtctt acatgccgctc aaagaaagaa acgttggtgt 540
gaaacaagac caaggtgt 558

<210> 308
<211> 450
<212> DNA
<213> *Enterococcus faecalis*

<400> 308
atatcgaagt ggtctattta gaggacttag ctgctgaagc gttgattaat gaagaggtcc 60
gccgacaatt tattgaccaa ttcttagaag aagccaatat tcgcagcgaa tcagcaaaag 120
aaaaagtttag agagttaatg ttagaaattg acgacaacga agaacttatt caaaaagcga 180
ttgctggcat tcaaaaacaa gaattaccta aatatgagca agaattttta acagatatgg 240
ttgaagcgga ttatccattc attattgatc caatgcctaa cttatacttc acgcgtgata 300
actttgcgac aatggggcac gggatttctt taaatcatat gtattcagta actcgacaac 360
gggaaaccat ttttgggcaa tacatttttg attatcatcc tcgttttgct ggaaaagagg 420
ttcctagagt ctatgatcgt tcagaatcaa 450

<210> 309
<211> 280
<212> DNA
<213> *Enterococcus faecalis*

<400> 309
aattaaacaa agcaggaatc aagaaacaag tggctactgt tttaacacag gtggtcgtag 60
atccagcaga tgaggcattc aaaaatccaa caaaaccgat cgggtccattt ttaacagaag 120
ctgaagccaa agaagcaatg caagcaggtg ctatttttaa agaagatgca ggacgtggct 180
ggcgcaaagt cgttccaagt cctaagccaa ttgacatcca cgaggctgag actattaata 240
ccttaataaa aaatgatata attaccattt catgtgggtgg 280

<210> 310
<211> 600
<212> DNA
<213> *Enterococcus faecalis*

<400> 310
agttgcacaa gtagcgatgg cgatggcttt taatcctcaa aaagattatt ttttaccgta 60
ttatcgtgat atgaccgcgt gcttggtttg gggcatgacc tccaaagata ttttaatggg 120
ttcttttgga aaagaagcgg atccttcttc ccatggtcgt caaatgccga atcattatgg 180
ttcaaaagag cataatattg tttccttctc ttcaacagta agtacacaaa tgccattagc 240
aacaggtggt gggttatgcag cgcaacttca aaaagctgat tttgttgcat tgaccaccac 300

tggggaaggc tctgccaatc aaggagaagt ccaagaagct attaactttg caggcgtaaa 360
aaaattacca gtcatttttg ttgttgaaaa taatgaatat gcgatttctg tccaattga 420
agaacagtat gccataaac gaatggccga tcgcgcgaaa gcttatggct ttgaagggtg 480
gaccgttgat ggtagtgatt ttgctgaagt ctatctagca tttaaagaag cagtaaaagc 540
ggctcgcggg aaaaaaggac caaaattgat tgaattaatg gtttctcgct tgacttctca 600

<210> 311
<211> 528
<212> DNA
<213> *Enterococcus faecalis*

<400> 311
cgagacaag aaagacaaca caacgaactc ttctagcgta gcatcttcag aaacgaaaaa 60
atcaactgaa tcatcagcac cagcgaaaaa agttgccggt ggcgatttaa aagatggtac 120
gtataaatta gaagaaaaaa atgaaaaaaa tggttaccgt gcagtctttg aaatgactgt 180
aaaagacggc aaaatcactg aatctaaata tgacaacatc aatgctgacg gcaaactctaa 240
aacagaagac actaagtatg aagaaagcat gaaagcaaaa tctgggtgttg gaccaaaga 300
atacatcaaa caattaaacg attcttttgt taaagcacia agcgcaagcg gtgtggaagt 360
agtaactggt gcgactcatt catctgaatc attccaaaac tacgcacaac aattaatcca 420
agcagcacia gctggtaaca cagacacaat cgaaatcgac aatggggcaa cattgaaaga 480
tggtacgtac tcattgaaag aaaaaaatga ctcaaacggc taccacac 528

<210> 312
<211> 451
<212> DNA
<213> *Enterococcus faecalis*

<400> 312
ttttcacttt taggagctat ttttatttta gctagttgtg gcataggaaa agatgctgtc 60
acagatacta agtacaaagt tagtttgacg caagctgctg aaatctatga aaaagaagct 120
ggcaacagca aaccattagt aaatgtccaa ttgatacag aaccagcaag tgactacagc 180
tatatcttta ctaacgatac agaaacactt tacgtgaatc ctgaaacagg aaaagtcacc 240
aaaaatactg aagcaaatca acttggcgaa aacgagacag ctttttcagc tgctgaagtc 300
aaagaattag gcgctgttaa cgacgtttta gccaaagcaa aaaaagaagt tggaggactt 360
tctccacgta ttttgacttg gaagttaacc aaaaataaca ataaacttgt ttatacagta 420

gatgttaaaa cgactacggc agatgaaaaa g 451

<210> 313
<211> 274
<212> DNA
<213> Enterococcus faecalis

<400> 313
caaaaccaac agaagaagaa ttaaaacaaa ccttgacgga tcttcaatat gccgtcacac 60
aagaaaacgc aacagaacgc cctttttcag gagaatatga tgacttttac caagacggaa 120
tctatgtaga cattgttagt ggcgagccgt tgttttagctc cctggacaaa tacgatgctg 180
gttgtggctg gccatccttt accaaaccaa ttgaaaaacg tggcgtcaaa gaaaaagctg 240
atttttagtca cggcatgcac cgagtagaag ttcg 274

<210> 314
<211> 564
<212> DNA
<213> Enterococcus faecalis

<400> 314
ggccttagttg tcagttgtgg ggcctttttt gcccaacctt ctgtgactca cgcagaagaa 60
gatattaccg cgattgctaa aaaaatgggg acgactttga aagcggatgg cattcccaaa 120
gcagccatcg ttgttgatgc tgattctgga gaaattctct ggtcgcagca accagattta 180
gcgtggaatc ctgccagtat tgccaaagtg atgaccatgt acttggcctt tgaagcaatg 240
gagcaaggaa aatttacaat ggatacgact gtgactgcta cgcaaaaaga tgtcgatatt 300
tctaaaatat atgccattag taataacaaa attacgttag gtgttgctta tccagtccgt 360
gaactgttaa aaatgattgc tgtcccctct tctaattgtg cgactctcat gttggcaaac 420
ttaatttcag ggaaccagcc tactgacttt gttcatttaa tgaatcaaaa agcggctgaa 480
ctagggatga caaatactac ctattacaac tgcagtggag cgcaagcaag tgcctttaac 540
ggcctgtatc aaatgcaagg aatt 564

<210> 315
<211> 478
<212> DNA
<213> Enterococcus faecalis

<400> 315
gtttgattgt tgcgagggtca aagaataatg ttataggcaa gaatggtaat ataccatgga 60

aaataaaggg agaacaaaag caatttagag agttaacaac gggtaatgtg gttattatgg 120
ggcgaaagtc ttatgaagaa atcgggtcatc cgttgcctaa tagaatgaat attggtggtt 180
ccaccacaac agagtatcaa ggagataatt tagtttcagt taaatcatta gaagatgcat 240
tattattggc taaaggacga gatgtatata tatctgggtg atatggacta ttttaaggaag 300
ctttgcaa at agtagataaa atgtatatca cagaagtaga tttaaatatt gaagatggag 360
atacattctt tccagaattt gatatacatg attttgaagt tttgataggg gaaacacttg 420
gtgaggaagt gaaatatacg agaacatttt atgtaaggaa aaatgaattg agtagatt 478

<210> 316
<211> 380
<212> DNA
<213> Enterococcus faecalis

<400> 316
ttttactaaa ccattaggtg taaaattacc cccatttttt gatattgcac attttgacgc 60
aatggctgaa attttaaata aattcccttt agtttacgtg aatagtatta atagcatcgg 120
taatggttta tatattgaca gtgacaagga agaagtggtc attaaaccaa aaggaggctt 180
cggtggactg ggcggcgaat atgtcaaacc aacagcgtta gccaatgttc gtgcgtttgc 240
gcaacgtttg aaaccagaaa tcaaaattat tggaacgggc ggtattacat gtggaaaaga 300
tgtttttgag catcttttat gtggtgcgac attagtacaa gttggcacac aattgcatca 360
agaaggtcca caagtttttg 380

<210> 317
<211> 537
<212> DNA
<213> Enterococcus faecalis

<400> 317
catgtattgg ttgttagata gggagtatga aaacttatat aatagtactt ataaagaaag 60
tgcgcattta agagtgcaaa ttgcagacga tttgtcaaat ttaccattat cctatttttc 120
aaaacataat ttatcagatt tatctcaaac tatcatgtct gacgttgaag gtattgagca 180
tgcgatgagt catgcaatac ctaaatccgg tggatggct ctgtttttcc cttttatttc 240
agtgatgctt ttggttggtg atgtcaaaat gggattagct gttattttgc caacgttatt 300
tagttttgtc ttaatcttgt tatcaaagaa atcccaaacg aaagccaata ctaaatatta 360
cgatactttg agagaaaact cggaagaatt tcaagaaact attgaattgc agcaagagat 420

taatagcttt aatctatcta aaaaagttca agacagactt ttcaaaaaaa tggaagagag 480
tgaaaggatt catttaaagg tagaattaag tactttttca gtcatggcct tatectc 537

<210> 318
<211> 606
<212> DNA
<213> *Enterococcus faecalis*

<400> 318
gatcaggaag atcaatcagg aaaaacacaa tggacaaagt attatctaac cgttttatttt 60
tctggcttat ttaattttct gatgattctg attttatcag ttttatttgg gacgttaagc 120
gaaaccttta ttgtatacgt cgtactgatt tttttacggc ctgtcgcagg tggctggcat 180
gcaaaaacta aatggctctg tcgtctagaa agcattgtta tctatgtcgc cataccattt 240
gtattgaaaa attcttctgt gagcttaccg tttatttata aaattctatt gatttgcctc 300
ttagtcgtat tattttattg gtatgcgcca caaggaacag caattgaacc tgttcagcca 360
tctgatttaa acgtgctcaa aaagcaaagc cttataaggg tgtgtttact tattttatgt 420
agtctgtttg tcaaagaaaa gattgcttca gtaatactct acggtctcgt catccaaggt 480
ctgatgatac tccctgtaac aaaaaattta attgaaggaa gtgtttttat gaaatttggt 540
aaaaaaataa ttaaaaatgt tattgaaaaa agagttgcaa aagtcagtga tgggtgtggga 600
actaag 606

<210> 319
<211> 507
<212> DNA
<213> *Enterococcus faecalis*

<400> 319
gttgggctac tcttggttga tttatgcgct gacagtcggt gtttttacag gatttttact 60
cattcacaaa aagaggttct caatttttaa agcgatattt ttatccggtt ttacattgct 120
tatggtttcg tttatcaatt acacggagca aacgatttta agtggttttt ttcaacagat 180
ttatcaaaat aaattattat ggattgcctc aaatgttctt ctgttgctta taaatatctg 240
gattgcttta aaaattccca atagtgtttt tttaagatta aatcgtgtgt tagaaaatag 300
ccgaattttt tttgggttgt tacttttatt gttgattctg ttgttacttt ttgtgttttt 360
gatttcgcca gagatttcac ctgactttat gcgaggattt gtcacggtaa atagttctaa 420
attggagtta ttaataagt taggtttatt tttaattctg attggcttag tcattgaagc 480

ttatttggaa gaacaacgta tcaacac

507

<210> 320
<211> 500
<212> DNA
<213> Enterococcus faecalis

<400> 320
ttacgttaga agaagcatac caagagtcaa aacggatgca agaattggtc aatttttcac 60
caaataatca attgctctat aaaacagctg ttcagctaga aggattgcct cgccatgttt 120
ctacgcacgc agcaggtgtg gtaattagtg atgaaaatct tttgaatttg gttccgttac 180
aaccaggatc gaatgaaatt ttattgaccc aatttactat gaatgatgtt gaaaaaattg 240
gtcttctgaa aatggatttc ttgggcttaa gaaatttata catcattgat gataccctca 300
cagctgttaa acgcgtctat aatcgaacca ttcgttttaa tcagattcca ttagatgacg 360
aaacaacgct ggctttattt agaaaagggg aaacaagtgg cgttttccag tttgaatctg 420
ctggaattcg gaatgtatta agaaaattag ggccaactag cattgaagat attgctgctg 480
tcaatgccct gtatcgtcct 500

<210> 321
<211> 407
<212> DNA
<213> Enterococcus faecalis

<400> 321
tttatgaagg cccaaagaat gatcttctgc taccttcaat tcaggctttt ttatcttaag 60
tgcctcaaga aataacgaat cggttttctt tttcattaaa aagacttttg agccttcctt 120
aaattctgag gaaaaaattt cgatgctttt ttcattgtag gttacttttt ctatctgaga 180
aagcggaagt gcttttttgc gaaaccacaa aacatctctg acaattaaag atgtttctgt 240
catattaaaa gaccgcgcaa ttcctagata agcaaacaca aaaaatggaa ccatcaccag 300
attactaatc aagtaaggac cattattttc caatgctaaa attaaactaa taaataatat 360
acaaaatgtg caagaccagt aaataattgt tgatgctaatt tctggct 407

<210> 322
<211> 607
<212> DNA
<213> Enterococcus faecalis

<400> 322
tttacctcac cgaccaatcg cggcaacaat tgcattgtgcc tttaggcatt gttagtaatc 60

acgaagccga atttaaagtg ctgattgaag ctttaaaaca agcgattgcc aatgaagaca 120
atcaacaaac cgttcttctc cactcagata gtaaaattgt tgtccaaaca attgaaaaaa 180
actatgctaa aaatgaaaag taccagcctt atttagcaga atatcaacaa ctagaaaaga 240
attttccttt gctcttaatc aaatggctac ctgaaagtca aaacaaagcg gccgatatgc 300
ttgcacggca agcattacaa aaattttatc ccaataaaaa gtagcactgt ttacttaatg 360
cttttccttt attaatttga taattaaaca cgtggagcaa aaattccaag tgatttttgc 420
tccacgttta aaaacagata aacggttctg tctcgacttc ttcttatagc cacttattct 480
tttgtegtta tttccgcaa ttgccattg gttagcgaaa ggattgcttc aggcgctaata 540
tcaatttgca tgccacgttt gcctgcagaa acaataattg cagaatattg ttgagcttct 600
tcagcca 607

<210> 323
<211> 521
<212> DNA
<213> Enterococcus faecalis

<400> 323
tctgtttacg ttagcgggtct ttctacaagg aggcgttact gatttaaaca cgaatcaaata 60
tggacaagtg attcctaata gccagccgc agaagctggg ttgaaagaaa acgataaagt 120
cttatcgatt aataatcaaa aaatcaaaaa atacgaagat ttacaacca ttgtgcagaa 180
gaaccccgaa aagccgttaa cgttcgtagt tgagcgtaac ggcaaagaag agcaactaac 240
agtgacacca gaaaaacaaa aagtggaaaa acaacaatt ggtaaagtcg gcgtttatcc 300
ttatatgaaa accgatttac cgtcaaaaatt gatgggcggg attcaggata ctttaaata 360
tacgacacag attttttaaag cactcggctc actattcaca ggcttttagtt taaacaaact 420
aggtgggcca gtcattgatg tttaaattatc ggaagaagca tccaatgctg gagtaagtac 480
agttgtattc ttaatggcca tgttgtcaat gaacttaggg a 521

<210> 324
<211> 531
<212> DNA
<213> Enterococcus faecalis

<400> 324
ggcgacgaag ttaaagtga taataaaca attgtttctg gactcgatgt ttcggcagct 60
tcggtagtg agatgatttc aaagttagta aaagaagatt tgggtgagca ttctccttat 120

caaggggtac aattaactga aaaaggctta aaaaaagcga gtacgttaat tcgcaaacac 180
cgaatctggg aagtcttttt agtagagcac tttaaattaca cttggaatga tgtgcacgaa 240
gaggcagaag ttttagaaca tggtacttca cagacgcttg tgaaccgttt agcggattat 300
ttaaatcatc cagaattttg tccacacggt ggtgttattc ccgaagataa tcaaccatt 360
catgaggaga aacgccaaac gttaacagac taccctggtg gcacaaaaat tcggattgca 420
cgtgtcttag acgaaaaaga attactggat tatttagttt ccattgattt aaatattcaa 480
gaagaatata cgattaaaga aattgctgca tatgaaggac cgatcaccat t 531

<210> 325
<211> 342
<212> DNA
<213> Enterococcus faecalis

<400> 325
gatacgaaga agatagcgaa acggttcaag ataaagtcac agcgtgcca agtaccggtg 60
aatttgcttc tgacaacaga aaagcaaaaa gctgtgataa ggaacagaac aagtcaaaga 120
aaatatggaa ccacgtgtag aataaacagt taaagggagg aaacaatcat gggctttatt 180
tgggcattaa ttgtcggcgg ggtcattggg gcaatcgtg gagcaattac taaaaaagga 240
tcatcaatgg cattattgca atatcattgc agggttagtt ggttcaacaa ttgggtcaagc 300
catttaggca catgggacaa gcttagctgg gatggctatt gt 342

<210> 326
<211> 512
<212> DNA
<213> Enterococcus faecalis

<400> 326
aagatggtac gtgtattcgt tttgacactc tttggcaagc aggtttgcaa gcttgttttg 60
aaacactaag tatgttagcc cctcatcatt cagcagaaat aaaaaagata ttagctattc 120
aggagcaacg ttttttgcaa aaacatttac ttgatgaagt cctttatcag gaactttatc 180
aggaattggc gcaatttgag gaattagtcg aacagggaat cagcagtcga tggctggagc 240
aattttttta tgattattta cgaaaaaatc tgaaaaagat cgaaccaatt ggtgatttaa 300
aacagttatt tcttgagcta aaacggaaga actataaaat tggattagca acttcagata 360
ctttgccagc gactatggtg attatggaat atcttggttt aacagaaatg tttgatttta 420
ttgcgacagg agatcggtac ttaccgaaac cagatgcgga catgctccaa gccttttgtc 480

agtcacgtca attgaaggcg acagaagtaa tt 512

<210> 327
<211> 643
<212> DNA
<213> Enterococcus faecalis

<400> 327
ttatttctgt tgagggcaaa gcggaagcag gtaaatactt gttcttcaca accttaaaag 60
gaaccgtcaa acggacagcc gtaacagcct tttctaatat ccgtagtaat ggattaatcg 120
ccattagctt aaaagaagat gatgagttag ttaacgtagt aacgactaat ggcaatcaga 180
agatgattat cggaacacat gcaggatact ctgtcacatt tgatgaaaat actgtacgtg 240
atatggggccg gacagcatca ggtgttcgtg gaatccgtct ccgcgaaaat gattatgtgg 300
tcggcgcagc gattctggat gaaaataaag aagtcctagt cattactgaa aatgggttatg 360
gtaagcgtac aaaagcctct gaatatccag ttaaaggacg tggcggtaaa gggattaaga 420
cagcaaatat cactgagaaa aatgggtccat tagctggttt aaccacggtc aatgggtgatg 480
aagatatctt attgattacg aacaaaggcg tcattatccg ctttaacgtt gattctgttt 540
ctcaaacagg acgcgcaaca ttaggggttc gtttaatgag aatggaagat ggtgccaaag 600
tggtacaat ggctgttgta gaaccagaag aagtgaaga aga 643

<210> 328
<211> 402
<212> DNA
<213> Enterococcus faecalis

<400> 328
ttgatcggtt tgacgtaatg ataaaaaaag cgaagaaaac ctaccaacgc ctagacttag 60
aagaaaaggt cactctttta gaaggacaag cagctgagat tctaccaacg ttggaaggac 120
cttatgactt tattttttatg gatagtgcc aatcaaaata cattgaattt ttacctgaat 180
gtttacgggt gctgccagtt ggcggcggtt tgatgggtgga tgatgtattt caagctggga 240
caattttaga ccctgctgag gaagtaccga aaaaaaatcg agcaattcat cgtaaattaa 300
accaattttt agatgtagtc atggctcacc ctgatttaac ttctacttta gttcctcttg 360
gtgatggagt tatttttaatt accaaagaga aagaaacgat ta 402

<210> 329
<211> 608

<212> DNA

<213> Enterococcus faecalis

<400> 329

```
agcgactaga gagcatacaa gtaaacgaac gggcgttgcc ttgtgggtgg tgacggagtt      60
agccataatg gctacagata tcgctgaggt aattggtggt gccgttgctt tgcaattatt      120
atttggtttt ccattattaa ttggtgtggt gataacaacg tttgatgttt tattactggt      180
gctactgaca aagttaggct ttcgcaaaat cgaagcaatt gtttcttggt taattgcagt      240
catctttttt gtttttgctt atgaagtggc attagcagat ccaaagtgtg gtgaagtatt      300
acgagggttt attccagaca caaaaatagc gacagataaa tccatgttat ttttagcctt      360
ggggatcggt ggagcgacag tcatgcccc aacttatat ttgcattctt ccattgcgca      420
agcacggaaa tttgatcgta acgatgatgt tgagaaagcc aaagcaattc gtttcactac      480
ttgggattca aatattcaat taactgttgc tttcgtcgta aattgtttgt tgtaattttt      540
aggaggagca ttattttatg gaaccaacag tgaattaggt aaatttggtg atttatttga      600
tgctctga                                         608
```

<210> 330

<211> 450

<212> DNA

<213> Enterococcus faecalis

<400> 330

```
aaattgttgc acgtatggaa aaaatgaaag acggaaattt aagtggatc caacgacata      60
atcaacgaga aaccaataat cattccaatc ctgatattga tattgagaaa tctcacttga      120
attatgactt agtcaatcct ggttcaatca attatcgga gaaaatcaaa caaatcattg      180
agagccaacg aatcagtaaa cgagcgggta gaaaagacgc agtccttggt aacgaatgga      240
taatcactag tgataccgcc ttttttcaag agaatacaga cacacaagca ttttttaccg      300
atgttgctgc atatttctct gatcgctgcg gtgcacaaaa tgtcgcctat gccacggtac      360
atttagacga aaccacgccc catatgcact taggaattgt gcctatgtac gaagggcgat      420
tgagcagtaa acaggtgttt agtcggcaaa                                         450
```

<210> 331

<211> 360

<212> DNA

<213> Enterococcus faecalis

<400> 331

caatggaaca aaggccactc tgatgaaacg tcgtttgctg aaaatattcc agctaataat 60
tgggaaaacg aattggccat gctctttatc ttaattaatg atggcgaaaa agatgtttcc 120
agccgtgatg gaatgaaacg aacagtagaa acttctagct tttatcaagg ttggttggac 180
aatgtggaaa aagattttatc ccaagttcat gaagcaatta aaacaaaaga ctccctcgt 240
ttaggagaaa tcattgaagc caatgggtta aggatgcatg gaaccacctt aggcgctgtc 300
cctccattta ctactggtc cccaggcagc ttacaagcga tggctttagt tcgccaagca 360

<210> 332
<211> 526
<212> DNA
<213> *Enterococcus faecalis*

<400> 332
ctgcggttaa agtcgttgca ttttctaaaa gggaaatgag tcccagataa agtgaaccgc 60
tatacaagtt tcctacgcga cgactataga tgatgctttc ttcataacgg gctaaaattc 120
gttcctgttc tgcttcagtt tggtcggaga tttttgctaa taaggctttt ttgccattt 180
ttgtgtaagg aatatggaac gctaaagcat cataatctgc aaaatcaaga ccggttcttt 240
ttttatgttc atcccagact tgggcaaaag attggatgta ggtttcgttt gacaaaggac 300
catcgaccat aggatacggg tggcctgttg gacgccaaaa gtcatagata tcttgcgtea 360
gcatcacatt atcctctttt aaagccaaga tgcgcggttc actagcaact aacattgcaa 420
ccgccccagc tccttggtga ggctcaccgc cagaatttaa tccatatttt gcaatatctg 480
ctgctacaac caagactttt ttatctggat gtaaggctac gtgatt 526

<210> 333
<211> 512
<212> DNA
<213> *Enterococcus faecalis*

<400> 333
atccgactat gcgtttactg aagaacaagc tgaagcaatc gttactttac agctataccg 60
tttaaccaat acggatatta ctgatttaca agaagaagcg aaaacttttag aacaacaaat 120
tgctgagtta ttgaacattt taaacaatga aaaagaacta ttctcagtca tgaaaaaaga 180
acttcgcgaa gttaaaaagc aatatggcaa tccgcgctta actcaaattg aagaggaaat 240
ccaagaaatc aagattgaaa cagccgtgtt agttgcgag gaagacgtgg tcgtaaccgt 300
gacgcacgaa ggctatatca agcggagtag tattcgttct tatacagcat caaaaccaga 360

agaaatcggc atgaaagaag gcgacttttt attatatgct ggcgaagtca atacattaga 420
tcattctttta ctagtaacaa ataaagggaa tatgatctat cgccccgtcc atgagttgcc 480
agatttacgc tggaaagaaa ttggcgaaca ta 512

<210> 334
<211> 604
<212> DNA
<213> Enterococcus faecalis

<400> 334
aggatcaatc gtaaattggtg tatacaaaac attttgttat tcatacatTT gataaattaa 60
acaatgcctg ctcttatatt gagaatgcag aaaaaactga agtcacgaat gataatccgt 120
ctgaacactt ggaacattta tttcaatata ttgtgaatga cgataagaca tacatgaaaa 180
aattagtttc tggatcatggc attgtggatc caacaaatcc ttatgaagaa tttaaattaa 240
caaaattaca agcagcaatt caacgaaaaa tcgggtacac attcgatcca aaatcagaac 300
gattgcttcc gccaacgtta acagaattag aaaaaggcaa cgccgtttta gcacaccatt 360
taatccaatc attttctcca gaagatgatt taacgccaga aaaaatacat gaaatagggt 420
acaacacggt gatggaattg acagggtggaa agtatgaatt tgtgatcgcc acacatgtcg 480
acaaagaaca ttacacaat catattatTT ttagttcaac caacttaaaa acaggtaaag 540
cctttcgctg gcaaaaagga accaaaagag tctttgaaca aatttcggat aagattgcag 600
cgaa 604

<210> 335
<211> 451
<212> DNA
<213> Enterococcus faecalis

<400> 335
aagatggtga aacattggtg gttacaactg cagatcattc aacagggtggc ttgtcttttag 60
gcaaaggaga tcaatacaac tggttgacgg agcctttaca tgcggcaaaa cgcacgcctg 120
atttcatggc agaagaaatt attaaaaatg gtaatgtgga aaaaacagtg actgagtata 180
ttgattttca attaagtga gctgaattga aagcagtga aacagcggcg gagtcaaaag 240
atgttgaaaa aatcgctcag gcattaagaa agatTTTTga tgaacgttcg aatactggtt 300
ggactactgg cggacacaca ggagaagatg taaatgtcta tgcttatggc ccacaagcag 360
aagctttttc aggacaaatt gataatacag accaagcgaa gattatTTTT ggcttagtag 420

atggcaccgg gcaaaaagct gagattaaag a

451

<210> 336
<211> 543
<212> DNA
<213> Enterococcus faecalis

<400> 336
gtttccgttc aaataaccac aaatcagaca acatttacag aggaacaatt aacggattat 60
tggcagttgg ccttggttaa tagtcagtgc aatacaccgt tagttcagaa agtcctaaaa 120
acacagacac cacaatttga agatcggaaa attatcttac ctgttgataa tgaagcagtt 180
attccttata tgaagcaaca atatttacca attattgagg aactttattt ctcttatggg 240
tttcctaaat ttcataattga accaaaaatg gatcaacagc aagctgcaga agtggtgaaa 300
aagtttgaag agcaaaaatt agaacaagcc gcagcctttc aacaacaagc tgctgaatcg 360
cttggttaaac atgaacaaat gaaaaaagaa aaacaacaac aagcgcctgc gtttgatggt 420
ccaattcggt taggtcggaa tattcccaat gatgaacca ttatgcccac gggaaatata 480
ctggaagaag aacgtcgat aacgattgaa ggctttattt ttgataaaga agtgcgatgaa 540
ttg 543

<210> 337
<211> 578
<212> DNA
<213> Enterococcus faecalis

<400> 337
aattgcagga gggtcacac cagagatttt acagctagtt aaaaaagcac taaaagaagc 60
cgagcaaccg ttgcagttta ttgtatttga tacaaatgaa aatcttgata ctgaaaatct 120
ctggaaatat gttcattgct cagatgaggc cgcggtagca caggaagctg tcagtttagt 180
tgcaaccggt caagcacaaa ttttattgaa aggaattatt cagaccaca cattactaaa 240
agaaatggtg aaaagtgagc atcaattaaa aaataaaccg attctttccc atgtagcaat 300
gggtggagctg cctgcgggaa aaaccttctt gttaaccgat tgtgcgatga atatcgcccc 360
cactcaagcg accctcattg aaattggtga aaatgctaaa gaagtcgccc aaaaattggg 420
actgcaccac ccgaaaattg ctttggttaag cgcagcggaa aatttcaatc ctaaaatgcc 480
ttcgtctggt ttagcaaaag aagtcacggc acattttaat aatcaacaag aggctacggt 540
ttttgggccc ctttcgcttg atttagcgac ctctgaag 578

<210> 338
<211> 320
<212> DNA
<213> Enterococcus faecalis

<400> 338
aatgcgtgat caggggtgtat gataaaactc ttggaaagag gcagaatttt gaaagttgca 60
tatgcaagag tttcatccat tggcaaaact tggaacggca aattcaagag ttaaaaaaat 120
taggagcgaa aaaaatattt gtagagaaaa aatctggcgc aagtattgaa caacgactaa 180
tttttacaga agctatctat tttgtgagag aatccgatat ttttatggta gaagccattg 240
accgattagg cagaaattac gatgaaatta ttcagacggt taattttattg aaaaataaaa 300
atgttcgact cataattaca 320

<210> 339
<211> 693
<212> DNA
<213> Enterococcus faecalis

<400> 339
ctcaacagct tcaacaatcc attcaaattt tacaatttaa tacggaagaa ctggctgcct 60
ttgttgaagc gaaagcacta gagaatccat taattgattt acaagtagac acgcagtaca 120
ccacagattt tccgataact agtcgttctt acaccaacca agacgaagaa aataattata 180
tgaatcaaatt tccagactat cattttatcat tatttgagtc tttaattgat caaattcatt 240
tgaattaccg cgatacatac ttgcgaacat tgggtattggt tttagtagaa tatatagacg 300
tgaatgggtta tttaaagatt tcgttagaag aagcggcaga gaaaaccgaa gcaagcgcca 360
ttcaaattgct agatgcatta actttgttac aacagctaga tccagcaggt gtggggggcac 420
gcaatttaca agaatgtttg atgctacaaa cagaacgaga cgataccgcg cctaacttag 480
cgtatatattt attggaggaa gagtttgatg ccttagtgag tcgtaaattg ggcccgttag 540
ctaaaaaatt cgggattgaa ttagcagaaa ttcaattgat ttttgattat atacaaacgt 600
tatcgccagc gccaggggaat atttttgatg cgaccgagga attgtatatt cgaccagatt 660
taactgtccg aatcaaggaa gatcgaatag tgg 693

<210> 340
<211> 210
<212> DNA
<213> Enterococcus faecalis

<400> 340
 aggttttagaa gtgggggagt ttgtacacac gctaggagat gcccacttat atcaaaatca 60
 tgttgaacaa atgcaagaac aattatcacg agaagttcgt tctttcccaa cgctcgtttt 120
 gaatccagac aaggcttctg tttttgattt tgatatggaa gatattaaag tagaaggcta 180
 tgaccacat ccaacgatta aagcgccgat 210

<210> 341
 <211> 504
 <212> DNA
 <213> Enterococcus faecalis

<400> 341
 aacgcacatc tgaaagctac gaaaaaactg tcaaccatat gaaagatgta ttgaatgaaa 60
 tctcttctcg catgcgtaca cattcagttc catggcatac agcaggtaga tattggggac 120
 atatgaactc agaaacatta atgccttctc tattagctta caactttgca atgctatgga 180
 acgggaacaa cgttgccat gaatcttctc cagcaacttc tcaaattggaa gaagaagtag 240
 gacatgaatt tgctcacttg atgagctaca aaaatggttg gggacacatc gttgctgatg 300
 gttcttttagc taacttagaa ggcttatggg atgccgtaa cattaaatca ttaccatttg 360
 ctatgaaaga agtaaaacca gaattagttg ctggcaaatc agattgggaa ctattgaaca 420
 tgccaacaaa agaaattatg gacttattag aatcagctga agatgaaatt gatgaaatca 480
 aagctcattc agctcgttca ggta 504

<210> 342
 <211> 400
 <212> DNA
 <213> Enterococcus faecalis

<400> 342
 atggaggggtg ataacatgaa tatcattgac gagctagcat ggcgtgatgc aatcaatcaa 60
 caaacaacg aagaaggact aagagaactt acagaaaata cgagcatttc gctatattgc 120
 ggtgtcgatc caactggaga tagcatgcat attggacatt taattccttt tatgatgatg 180
 aaacgattcc aattagcagg tcatcaccca tacattttta ttgggtggcg aactggaaca 240
 attggtgacc caagtggacg aacaactgaa cgtgtttttac aaacgatgga agctgtgcaa 300
 cataatgtgg acagtctttc aaaccaaattg aaaaaattat ttggtaaaga tgctgaggta 360
 acaatggtga acaactacga ttggttatca gaactatctt 400

<210> 343
<211> 585
<212> DNA
<213> *Enterococcus faecalis*

<400> 343
caggaggaac attggttggt cttcacaaaa atcaaccagt aactattacc tatggcaatt 60
tgaatgctag ttattttgggt aaaaaaattg ctagtgctga attccaatat acagtgaagg 120
ccacacctga ttcaaaagggt cgattgaatg ctttcttaca tgatgatcca gtggccacaa 180
ttgtctatgg aattaacatt gaccctcgta caaagaaggc tgggtgctgag attgaaatgc 240
tcgttcgctt ctttggagaa gatggcaaag aaatcttgcc aacgaaagag aatccatttg 300
tattttcagg tgcttcatta aattcacgtg gtgaaaacat tacgtatgag ttcgtaaaag 360
taggaaacac ggatactggt catgaaatta atggatcaaa agtagctcgt catggaaata 420
aagtttattc taaaacggat attgatgtag ggacgaatgg gatttcaata agtgactggg 480
aagcagttca aggcaaagaa tatattggcg caactgttat ttcaacacca aatagaatta 540
aattcacttt cgggaatgaa attgttaaca atccagggta tgacg 585

<210> 344
<211> 544
<212> DNA
<213> *Enterococcus faecalis*

<400> 344
cgacagaact tgctaaagta gatccaaaaa cggtaacaaa acaagggatt cgagatacct 60
ttgatgcaga aaaagtgacg attgatttat ccaaagtgaa agtttatcaa gcagacgcaa 120
gtctaaacga gaaagactta aaagctgttg ctgcagcgat taattcagga aaagccaaag 180
acgtgaccgc ttcttatgat ctttaatttag accaaaacac cgtcacagca atgatgaaaa 240
ccaacgcaga cggctccgtt gtttttagcaa tgggggtataa atatttactt gtcttgccgt 300
ttgtagtgaa aaatgtagaa ggcgattttg aaaatacagc tgttcagctg acaaacgatg 360
gtgaaacggt aacaaatata gtgattaacc atgtgccagg tagtaatcct tccaaagatg 420
taaaagcaga taaaaacggt acagttggca gtgtttctct acatgataaa gatattccgt 480
tacaacaaaa aatttattat gaagtgaat cttccgaacg tccagccaac tatggcggaa 540
tcac 544

<210> 345
<211> 341

<212> DNA

<213> Enterococcus faecalis

<400> 345

```
cttcttttcgt gctttcaacc acaatagatt gctctttatc agccaacagc caatggagag      60
gggataacgg aagttcatca ctaaaattaa tatttactaa attaagattc ttcaataatt      120
tttttgcttc atctacagta gagcattggc ccaataccca aggaataaac tcaaatggag      180
aaacattttc ttttccttct tcaatttttt tataatctgc atagcctgaa aagtttaatc      240
cagccattcc taatcctttt tcatttattg catcataata aagcggataa tcagcaatcc      300
cagcagcaat tccaattatt gcaaaatgat gatctaaatt t                          341
```

<210> 346

<211> 594

<212> DNA

<213> Enterococcus faecalis

<400> 346

```
aaacctggat gatagtgata ggaagtttat aggtaaatat tttaatgttt cggaagggaa      60
aaaattacca gattttaaac ctgaagaagt taatagttct attttaaaca ttaatatttt      120
aaacaaagat tttaagtctt ttaattggcc atataaaaaa attttatctc atattgatcc      180
agtgaagaa caactaggga aagatataac catagctcta attgactcgg ggattgatag      240
gcttcacct aatcttcaag acaataacct aagattaaaa aaccatgtta atgatattga      300
gttagatgaa tatggtcatt gtacacaagt tgctggagta atagacacga ttgctccaag      360
agtaaattta aattcttata aggtgatgga tgggacagat ggaaactcta taaatatgct      420
taaagctata gttgatgcta caaatgatca agtagatata ataaatgtga gtcttgatc      480
atataaaaat atggaaatag acgacgaaag atttactgta gaagcattca gaaaagctgt      540
taactatgca agaaaaaata acattctaatt tgttgcatca gcaggaaatg agtc          594
```

<210> 347

<211> 504

<212> DNA

<213> Enterococcus faecalis

<400> 347

```
caaggagagc atagtgaatg tgctttggca tgtatcacta tgctacttaa ttattatggt      60
aatcaaagta cactagtaga actaaggga aaatatgggg tgcccaaagg aggactaact      120
atcaagaata ttcgtactgt ctttgacgaa tatggatttg atgtatcgac atttaaata      180
```


agtttttcaa attattttaga tcttccgact cctgtaataa gttatttgga taatcaacat 240
 tttgtggtca tagagaaaat aaaaaagaag aaagtattaa tcttagatcc tgcaagtaat 300
 aaacgctgga ttgatatttc agaattcaaa aaaaattttt caaatatatt aatatacgca 360
 cataagaaaa agactaaaaa agaaggcaaa aggaaacagt ttttttttaa gtcatttatt 420
 tttacaaaat tcaaaagata tttctttagt ttaataatat tatcatttgt ttcacaactt 480
 ttattactct taattcctat tgca 504

<210> 348
 <211> 562
 <212> DNA
 <213> Enterococcus faecalis

<400> 348
 gttagggcac ttagcttttg gattatttaa taaagttaga ccagagtcac taatatttgg 60
 gtttataaaa ttttcgtggg aaaatcagtt taagatcaga ttaaatacac agtggggatt 120
 ttttggtgga ttatttagat ataaaccaac tacgtttaat aataagaaaa ttctgagggt 180
 gttaaccggg ggaccaatat ttagtctttt ttttacatta accttttttg taaaaattga 240
 cttttttcaa tatttttctt tatttaattt ttcgatattt ttaattactg cagttccttt 300
 taattttaac gggtttatga atgatggata caatatatat aaattagtta ctaaggatta 360
 tatttttgaa atgtattata ttgtatcaaa tagcttactt aataaatata atcagtcaac 420
 tttcttaa at acaactgagg tatgcaaaat aataaaaaaa aataaagaat taccattata 480
 tgtgctaaat acattcttat tgtatgttat atatgagtat ttaatagaca aaaataatag 540
 gaaattaaaa ctaatatacc ca 562

<210> 349
 <211> 402
 <212> DNA
 <213> Enterococcus faecalis

<400> 349
 tggaaaattt aagtgtagtt cctagttttg aagaactaag tggtgaggaa atggaagcga 60
 ttcaaggtag tggagatggt caggctgaga caacaccggt gtgtgctggt gcggcgacag 120
 ctgcagcaag tagtgctgct tgtggctggg ttggtggcgg tatttttact ggagtaactg 180
 tagttgtgtc tttaaaacat tgtaaaata tactataaaa cttagtgagg tgaagcacag 240
 tgctaaataa ggaaaatcaa gaaaactatt actctaataa attagaactt gttggtcctt 300

cttttgaaga gttaagttta gaagaaatgg aagcgattca aggtagtgga gatgttcagg 360
ctgagacaac tccagcatgt ttaccatag gcttaggagt ag 402

<210> 350
<211> 562
<212> DNA
<213> Enterococcus faecalis

<400> 350
agcaaagtgg taacgagaag tacgacatta aaaatttaca agcttggaaa gaaagaaaaa 60
gtgttcttaa acaagatgat ttagactact tgattaaata taaatatgaa tcaactggata 120
attttggatt aggaataaca cctattgaaa actttcctga taaagaagtt gcaattcaat 180
acattaaaga tcaatcatgg tatatTTTTT ttgaatccat ttagattctt tataatgata 240
gtgaagagca attattagaa gtagatgcta gttatccttt tagatatttc ttacagtatg 300
ctcgttttatt ttactttgat ttaaactcag agttaaatat ttgtacaaaa gaattcatta 360
ttaattttatt agaaattcta acacaagagc ttattcactt aacaagtaaa acattagtgc 420
tagatttgca tactttttaa aaaaatgaac ctctaaaggg aatgatagt agcaagcgat 480
ttatctatta tctaaaaaaa agattttaact ctaaaaaaga tataatagct ttttatacat 540
gctatcctga gttgatgcgt at 562

<210> 351
<211> 590
<212> DNA
<213> Enterococcus faecalis

<400> 351
tagttggaat gaccgagaac gatggctcac cacgaaaaat caattttaaatt ggtttagggg 60
aagttttttat ctataaagat catgttgtag caacatttaa tgaaaaagtt gaatctttac 120
ataatgtgaa tgggcatttt tctttcggga ttaaaacgct tatcaccaat agttcgcaac 180
cgaatgtgat agaaacggat ttcggaacag caacggcgac tcaacgtttg acgattgaag 240
gagtgaccaa cacagagact ggccaaattg agcgagacta tccgtttttt tataaagtag 300
gcgatttggc tggagagtca aatcaagtac gttggttttt aaatgtgaac ctcaataaat 360
ccgatgtcac agaagatatt tcaattgcgg atcgacaagg aagtgggtcaa caattaaata 420
aagagagttt tacatttgat attgtgaatg acaaagaaac taaatatatt tcacttgccg 480
agtttgagca acaagggttat ggcaaaattg acttcgtaac agataatgac ttttaatttac 540

gtttttatcg ggataaagca cgctttactt cctttatcgt ccggttacct 590

<210> 352
<211> 648
<212> DNA
<213> Enterococcus faecalis

<400> 352
tcaacgtcac aaacaagaac ctgatatctg tgaaaatgca aatcaattga atgaagctgt 60
aaagcccaaa accggaaacg aaaacaaaca accaaaaata ccgaagaaaa aatctaatta 120
tagcaagtat atattcgcat tgtttaccgc acttattcta gtaattgtcg ctactggcgg 180
ctatatgtt tatacattaa aacagcaaga agtagaagct caagccaaat atgaaactgc 240
tgtaaaaaat ctcatggctt caatccaaga agagcaagac caaagtggaa tttcaacgaa 300
aatagatact ataaatgacg gagaaaataa gtgccttatt taccgtccag tttatgaaag 360
tactgttcct tttaaaaatg caaaccagct cttagacgag cttgctcaa agcaacaaaa 420
gaagcatcgt gaaaaagaag tgcttacagt tgccagaata aaagcaacag caatatcttc 480
taaaattggt cagtatagaa ttgaagcaga tagttttatc tgggatcgca gtaaggaaaa 540
ttttaaaaag ccagacagta tttctgagaa agccatttat gtttccgaaa aaactggtaa 600
agaaatcaca aataaggatt tgattccgga tgaaggaagt ctcttagg 648

<210> 353
<211> 520
<212> DNA
<213> Enterococcus faecalis

<400> 353
tcggaagtat tgcgttttggg gggacaacat tagcttacgc tgatgaagtg cataatagta 60
taaatacagga tatacaagat tctggtagta caattattgg agaaaatgat tcttctacca 120
aatcagctga gtataaaatg attcatgaaa ttgatggaac taaaattagt aacggtgaaa 180
atagtaaaga aacaactaca agttcaggaa ctatactggc tgaagaagca atagaaagtt 240
caaatacaaa aaattcaaag acaagtgaag tcgaacagga tcttcataaa gatgtatcag 300
gatctgaatc agtaaaacaa gtagaaactt ctgattctat aaaaaaatct gaagaatcag 360
ctgttaaaac attaaatctg gatgattcac aagagaatac taattcaata actaccaagg 420
cagaaaatga tgcgctatct acagttaatg atgaaaaagt attaaatgaa agtgatagta 480
ttatcaaata aattccttcg gaaacagaga atgtcgataa 520

<210> 354
<211> 668
<212> DNA
<213> *Enterococcus faecalis*

<400> 354
ttgtctttgg gcttctctct tttttcttgc ctatatTTTT agtctttgga ggcttacttt 60
tttttctttt attattaacg agtacgtcag atacttcaaa aaatgattgt attcagccaa 120
gtataaataa tccaactgat gcgacagata cacctaaatc gatcgagcag tttgtaaaaa 180
gccataaaga tgcttacctt ttatcatgga aagcagggtg ctttttaccg tctgctagta 240
tttctcaaac gatggtagaa aatgggttta attttactaa tccatcgggg acgtcatttt 300
ggcaggcaca caatatgggc ggtgttaaaa cgtcaaaaaa agaagatttt cctgtaactt 360
tagcaacatt cggccaagat tctgttgata tttctggtac aaagccaggg tcaaacgtcg 420
gtgatggcac tgggtggggca tatacctggt ttaaagacta caatgctgga attggttgaa 480
aagcagaatt tatggcacac cagacactgt atacagggtgc tatcaataat actgacggat 540
taagtacttt atcagctatt tattcaggag gatgggctac agaccctact tacctcatga 600
agttacaggc cacatataat agcttaggca agcagtttca atgggttgga caagaagcaa 660
tacagaaa 668

<210> 355
<211> 517
<212> DNA
<213> *Enterococcus faecalis*

<400> 355
ctatagattc cctatcttgt tgggtacaaag ataaataaag aaatattttt tttcgataga 60
atacgttaaa atatgaatag atatagatag taattatatt atctataaat agtagagtat 120
aacgatcttt tatttttgga ttttctataa attttaagta gtaagaaaat ctttttcggt 180
caaacttttc tataatctct aaatttttaa tttgaacaga attagttgaa ataagcatat 240
aaaaatttaa tagtaattgc tccttatcag attttagacg tactctttca attatattca 300
tgatatattc atcgatggta gagcttttat cagcaatttt ttctaattca gagtttatta 360
tatccaaatt atacacaatc actgcctcat ataaatcatg ttttgtttta aaaaagctat 420
atacggtagt agtgctgggt ttagcttcat tagcaatatc taaaagtttt gttttttcat 480
aaccaaattt agaaaagtgt ttcattgcgg taaatat 517

<210> 356
<211> 380
<212> DNA
<213> Enterococcus faecalis

<400> 356
atgtatgtat cttttgttct aagttgtttg cttggatttt ctgcctacag tctattaaat 60
aggctaaatt cgttggaatt tgtggatggt tggtagaca aagaaacaca aaaaatcaca 120
ctaaaacgct gtttttatga tacgtctttc aagaaacaaa cactaaaaga gttagaacga 180
gtatatattcc aattaaaaga aataatcaac gtgcaaataa acaagcggtc tttaaatacg 240
aatgacatac gtaatgtacg agaactagag gaaaaacaac aagaaataaa acgattcatg 300
ttagacgttt tagaagatgc ttattggaaa gaattagcaa atatgccaga agaccaacga 360
cacttagacg attgggattt 380

<210> 357
<211> 320
<212> DNA
<213> Enterococcus faecalis

<400> 357
aaagtactac cttttattgc cttagtcggc ttgttattgt tgtcagggtg tggaacagat 60
atgaaaaaga tattgactgc cgatggtggt aaatggaaag tggaagaaac acgtgcaact 120
tacacttttt ttgatgacgg taaattttca gctaattgact cagaggatag tgttagtggg 180
acatacactt atgatgaaaa aaataaaaaa ataacctttg acattactag cagaaactct 240
ttcattatgg aaaaagtaga atacaaagat aacaagatta caggggaaat tggcgaaaaa 300
caaagaacac ttataaaaca 320

<210> 358
<211> 503
<212> DNA
<213> Enterococcus faecalis

<400> 358
tgaacaaaaa gcacaggata gtgtaaaaga agttactgaa aatgttactc aaactatttc 60
aaacgatcaa cgtataccag ctgattttgt taggcacgtg gatggcgata ccacagtatt 120
aaaaattgac ggaaaagaac aaaaagttcg gtttttatta attgacacac ccgagactgt 180
gaaaccgaaa acaaaagttc agccgttcgg attggaagct agcaaacgca caaaagagct 240
tttgtctact gcttcagaaa ttacgtttga atatgataag ggcgataaaa cagatcgtta 300

cggacgagcg ttgggctaca tattcgtaga tggaacatta ctacaaaaaa cgcttgtaag 360
tgaaggatta gctcgtgttg cctatgtaaa agagcctaca actaagtatt tggcagaact 420
agagcaagcc caagaacagg ctaaaaatga gtcactcgga atctggagca taccaggtta 480
tgtgacacaa cgggggttta gta 503

<210> 359
<211> 220
<212> DNA
<213> Enterococcus faecalis

<400> 359
tgatgaaaat ttaaaagaag aagcagaaca attatttgat gatttagggt taaatatgac 60
aagtgcaatt acgattttct taaaacagtc tattaatgag caagcaattc cttttatgat 120
taataaggga aacaaagaga ctctacaagc attaaaagac attaaagaag gaaatgttca 180
tggtggattt tcttccgtgg aggatttaat ggaggattta 220

<210> 360
<211> 380
<212> DNA
<213> Enterococcus faecalis

<400> 360
tcaaatacac gtaagccttc tttcgtgctt tcaaccacaa tagattgctc tttatcagcc 60
aacagccaat ggagagggga taacggaagt tcatcactaa aattaatatt tactaaatta 120
agattcttca ataatttttt tgcttcatct acagtagagc attggcccaa tacccaagga 180
ataaactcaa atggagaaac attttctttt ccttcttcaa tttttttata atctgcatag 240
cctgaaaagt ttaatccagc cattcctaatt cctttttcat ttattgcata ataataaagc 300
ggataatcag caatcccagc agcaattcca attattgcaa aatgatgata taaatttcca 360
acttctcgaa atgaaaactt 380

<210> 361
<211> 511
<212> DNA
<213> Enterococcus faecalis

<400> 361
cattattttc attaggggat attagagata ttcttctcct tataaattat ttttttacgg 60
gaaagattga agacttattt cataagccgt tacatgatta tgagaaaaaa ttttcagaag 120

atatccaaat agaacggata gatatggtat tatctcaaaa ttatgatcca gaaatttatt 180
tattttttata tgaaaataaa attttagaat atgttgtaaa tggtaatgta caagaattaa 240
gtaatatgat atttaaaacta agtaatggtg ttgttcctgt ggtagtggg gataacgtac 300
gttctgaaaa gaattattca atagttgtat ttgagaagtt agcacaagca gctataaata 360
tgggaatgga cttaataaat gcatatcaga gtcgagatag ttttataagg aaaaatgaac 420
tatgtataaa tttaaaagaa gtattaaaag ttagagatac tgctatagta ttttatacct 480
ctgaaatagg aaaagctaaa gtaaggaatc t 511

<210> 362
<211> 526
<212> DNA
<213> Enterococcus faecalis

<400> 362
ttgcgatttc tgttgtagga accattattt ttgtaatagg actttatggt agtaaaataa 60
aaaaataaat cacaattaag gttctggttg ttattaatct atctcatgaa gcattagatg 120
aattagttct agaagtacct gttgtactag ttaaaaatac tgttaaatca aattttttgt 180
ttaaaagaat cattaagttg gtgcctaact ataaaatcaa attgactaaa atccaataac 240
attgggggat actctgtaaa tcgtgtgtcg cagtacgtta gtcttgtaat aaatagatct 300
taattaggag gggtttctat gaaaaatatt ttactttcta ttctaggggt attatctatc 360
gttgtttctt tggcgttttc ttcttattct gtcaacgcag cttctaata gaagtcgtgg 420
ccactgggca aaccatatgc ggaagatat gaagaaggac aacaattcgg gaacactgca 480
tttaaccgag gaggtactta tttccatgat gggtttgact ttgggt 526

<210> 363
<211> 505
<212> DNA
<213> Enterococcus faecalis

<400> 363
aatcaagccg ctgaaaagaa agaaaaatta gcaattgtga caacgaactc gatcttatcc 60
gatttagtga aaaatggttg gcaagacaaa attgagctgc atagtattgt gccaattggg 120
acagaccctc acgaatatga accgttacca gaagacattg cgaaagcttc tgaagcggac 180
attttattct ttaacggctt gaacttagaa acaggcggaa atggctgggt taacaaatta 240
atgaaaacgg ccaaaaaagt tgagaataaa gattactttt ctacaagcaa aaatggtacg 300

ccacaatatt taacaagtgc cgggtcaagaa caaacagaag atccgcatgc ttggtttagac 360
 attgaaaatg gcatcaaata tgtagaaaac attcgtgacg tgtagtaga aaaagatcca 420
 aaaaataaag atttctatac agaaaacgcg aaaaattata ccgaaaaact tagcaaacta 480
 catgaggaag ccaaagctaa atttg 505

<210> 364
 <211> 557
 <212> DNA
 <213> Enterococcus faecalis

<400> 364
 aaatgggtga aggaagatta gcaaattatt ctgcttcagg aaatacgttt caagaaaatc 60
 cgggatatac gaagaattat aatttctcgg atttacaatt caaccctaaa gcaataactg 120
 gtgatgtgtt acagggaaat acaattgatt ttgagggtta tgggaaacat aatattgcag 180
 cttcaactgc aaactgggaa attcgtcttc aattagatga acgattggcc cagtatgttg 240
 aaaaaattca agttgatccg aagaaggcg taggaaatag tagacgaact tttgtaagaa 300
 ttaatgattc gcttggcaga cctacaaaca tttggaaggt taattacatt cgagcaaattg 360
 atggactatt tgctggggca gaaacaactg atacacaaac tgctcctaac ggtgtgatta 420
 catttgaaaa aaatttagat gaaattttta aagaaattgg tgcagataat cttaaaagcg 480
 accgtttaat gtatcgtatc tatttggtta gtcacgaaga tgacgataaa attgtacctg 540
 gaatagaaag cactggt 557

<210> 365
 <211> 523
 <212> DNA
 <213> Enterococcus faecalis

<400> 365
 aggtacaggc atctttgttg gaagttcatg tctatcttct tcactttttg tagccgcaga 60
 agaacaagtt tattcagaaa gtgaagtttc aacagtttta tcgaagttgg aaaaggaggc 120
 aatttctgag gcagctgctg aacaatatac gggtgtagat cgaaaagaag acgcgtgggg 180
 gatgaagcat cttaagttag aaaagcaaac ggaaggcggt actgttgatt cagataatgt 240
 gattattcat ttagataaaa acggtgcagt aacaagtgtt acaggaaatc cagttgatca 300
 agttgtgaaa attcaatcgg ttgatgcaat cggtgaagaa ggagttaaaa aaattattgc 360
 ttctgataat ccggaataa aagatcttgt ctttttagct attgacaaac gtgtaaataa 420

tgaagggcaa ttatTTTata aagtcagagt aacttcttca ccaactgggtg accccgtatc 480
attggtttat aaagtgaacg ctacagatgg aacaattatg gaa 523

<210> 366
<211> 400
<212> DNA
<213> Enterococcus faecalis

<400> 366
ctggttcaaa agaagccatt gatgcccgcg ttcatttaat taaaaaccaa atcggcgaaa 60
caacgtctga ttttgatcgt gaaaaattac aagaacgttt agctaaatta gctggcgggg 120
ttgctgtcgt taaagtcggt gctgcaactg aaacagaatt aaaagaatta aaattacgaa 180
ttgaagatgc attaaacgca acacgtgccg ctgtagaaga aggcattggtt tctgggtgggtg 240
gtaccgcact tgtcaatgta attggtaaag tcgctgcgct agaagctgaa ggcgatgtgg 300
caacagggat caagattgtc gttcgtgcat tagaagaacc aatccgtcaa atcgctgaaa 360
atgctgggta tgaaggatca gtgattgttg acaaactaaa 400

<210> 367
<211> 264
<212> DNA
<213> Enterococcus faecalis

<400> 367
gatcgcgctg taattagagt cgcgaaagaa gaagaaaaaa ctggttgagg aattgttctt 60
gcatccgttg cacaagaaaa accacaaaca ggtgaagtta tcgcagtagg tgaaggtcgt 120
gtgcttgaaa atggcacaaa agttccgatg gaagtaaaaa ttggtgacac agtaatgttt 180
gaaaaatatt caggaacaga agtgaaatac gaaggcgtag aatacttaat tgtatcagcc 240
aaagacatta ttgccactgt tgaa 264

<210> 368
<211> 505
<212> DNA
<213> Enterococcus faecalis

<400> 368
atctcgcgga acaattagat agtattcttt tacaagtcag tgaagaagat gaactaatta 60
tttcagatga tggttctact gatcatacgt tggaaatTTT gagaacgtat gcagcgaatt 120
atccccaaat tcaattgtta caaggtccag ggcaaggagt gattgctaatt tttgcatttg 180
cgcttacgca tacgaaaggc gaagtgatat ttttagcaga tcaagatgac gtttggttgc 240

caaataaagt aacaacagtg acagaatatt ttgaaacgca ccctgacatc caagtgggta 300
ttagtgactt gaaaattggt gatgcggatt tacaagttac caatccctct tattttaagt 360
ttcgaaaagt caaaccaggg ttttggcgaa atgcgataaa aagtggctat attggggcag 420
gtatggcctt tcgtcaagag atgaaaaacg tcattttacc cattccgcca gaagttccta 480
tgcattgatat gtggattggc ttatt 505

<210> 369
<211> 688
<212> DNA
<213> Enterococcus faecalis

<400> 369
tcggctctaa tggatatgtt cattacatta acaagcgtag cgttgccatc cgcagcattt 60
gcagatgaat acgatacaaa gattcaacaa caagatcaaa aaattaatgc gttaactagc 120
caaatgtcag atgcagaagc aaaagttgcc gcgattgaaa atgatatggt tgaaacggcc 180
aaacaaatcg atacattaac agctaaaaag aacaagctat catcagaagt atctaaatta 240
tatagtgaat tttctgattt gaatgtccgt attcaaaaac gtgaagtaca aatgacaaaa 300
caagcacgcg atgtccaagt gaatgggtcaa agtgattcaa ttattgatgc tgtcttagat 360
gcagattcag tagcagatgc aattgggtcgc gttcaagcgg tctcaacaat gatgagcgcc 420
aataatgaat tactagaaca acaaaaagaa gacaaagcga ctgttgaaaa gaaaacaaag 480
aatgttgaaa aacaaattgc tgaattagaa gcagcaacaa agaattaata tgataaaaca 540
gaatcattaa aaacattgaa gattcaacaa gaagtggcta aaaatgattt agaagcacia 600
cgttctgaag aacaagggaa aaaagacggc ttcattaaac agaaaaaaga agcggaaaaa 660
cgtttagcag aagaacaagc acgtcaac 688

<210> 370
<211> 500
<212> DNA
<213> Enterococcus faecalis

<400> 370
gcttcattag cattagaaca atcatcagct gaaagttcta aagctggctt agaaaaacaa 60
aaagcagctg ctgaagcaga gcaagcacgc ttagctgctg aacaaaaagc tgcagctgaa 120
aaagccaaac aagctgctgc aaaaccagct aaagctgaag tgaaagcaga agcaccagtt 180
gcctcttcat caacaacaga agcacaagca ccagcaagct caagctcagc aactgaatca 240

agcacgcaac aaacaactga aacaactaca ccaagtacag ataatagtgc aacagaaaat 300
actggctctt cttcatcaga acaaccagta caacctacaa caccaagcga taatggaaat 360
aatgggtggcc aaactgggtg tggaacagtt acaccaacac cagaaccaac accagcgcct 420
tctgctgac caacaatcaa tgcattgaac gttctacgtc aatcattagg ttacgtcca 480
gtagtatggg atgcaggttt 500

<210> 371
<211> 529
<212> DNA
<213> Enterococcus faecalis

<400> 371
ttaactgaac aagaaaagca agcaatggaa aaagaagcat tagcattaaa taaagttttt 60
cctgaaaatc aagcagatgc ggcaaaagta acggaaatga tcaatgtcaa aaatcctacc 120
gaaaaacaaa agcaacaaat gagcgattac gttgtaggac ttatcaatga tggtcgcgaa 180
aagcttgggt taaaaagtt gaagatttct aaccaagcta tgaaatttgc ttgggatgta 240
gcaaaatatg ataatcccaa agaatttgat catgacgtaa atgcgatcaa tcgtgcagca 300
aaagaaaatg gttttaaaaga attccctgga caaaactttt atgaaaacct aagtatggga 360
agatttacga cacaagaagg taaagtttct atgtatgact ttgaaaaagc tgctcgaaat 420
gcacttgtaa gcatgttgat gaacgatgga cattctggct attcccattt agattcttta 480
ttagatgcaa atgaaacaaa catggcagtt tctatttcag gagatttaa 529

<210> 372
<211> 558
<212> DNA
<213> Enterococcus faecalis

<400> 372
acaaccaaca gtgaaagcta cacaaacaac ggagcaagcc attactgaaa aacagcaaca 60
agtaatagag aaacaagcaa ttgtcgatca aaaacaacaa gttgctgaca ctgcgaaaaa 120
agaaaaagac accattgatc aatctgttaa agaccaacaa gcagtgggtc atcaaaacaa 180
agacgcattg gttcaaagtc aacaagcagt gactgacca caagcagttg tagacgaagc 240
taaaaaagtc gtggatgaag caacaccttc agccattgaa aaagccaaag agcaagtggc 300
tactgataca caggctgttg atgaccaaca aaaagtagta gagcaagctc aacagacgt 360
taaccaacaa caagctgttg ttgatgaaaa agcaaaagaa acgactgctg ctaaagtgca 420

aaatgataaa gatcaacaag cagtaacagc tgcaaaacaa gaacaagtca agcttgaaga 480
attagcgaaa aatgcggaag cggaaaaagt aaaggcagaa aaagaacaag cagcaaaaga 540
agcagaattg gctaacaa 558

<210> 373
<211> 687
<212> DNA
<213> Enterococcus faecalis

<400> 373
cattggtggc tatttcattc gtgaattgga agccactaca atttccgatt ttaaaaaaaa 60
tatggattcc caagttgtcc aattgtcaaa cacgttaagt acgcagatga gcaacaaaga 120
tctcgaacgt agtgacgttg atgcaaattt aaaaaaagcg ttatctgatt tttcaaattgc 180
agatatttct gaagcgagaa ttgtcgatga taaagggatt attcgggcaa ccaatgattt 240
aaatcaacaa aatattattg ggaaaaagaa tgattatcgt gatttaaatg actttacgag 300
taaaaaatat caagcttttag ataataataa acgcgtgtat gtgaatgtcc agccgattca 360
atcgcttact ggagaaacag tgattggcgt cctttatgtg aaaagtaatt tagaaaataa 420
ataccaagaa attaccaaca cagcaagtat ctttttcaact gcttctatta ttgccgcagc 480
aatctcgatt attgtgactt tactgattgc acgatcaatc acgaagccga ttggtgaaat 540
gcgcgagcaa gccattcgaa tcgctcgtgg tgattacgct ggaaaagtag aagtccatgg 600
aaaagatgaa ttaggccaat tagcagaaac atttaataca ttatcagaac ggattgaaga 660
agcacaagaa acaatggaag cagaaag 687

<210> 374
<211> 534
<212> DNA
<213> Enterococcus faecalis

<400> 374
tatcttagct tcgcaaccag ttactcgttt taggaatgct tttttcaatg aaacggaaga 60
tatccaaacc aatgaagaca gtcaagactt aacctacacg agtaaagaag aacgattgtt 120
tgcagaagaa aaactgggaa aaattgattt taaagggacc ttgccagaag agaataaacg 180
ggactcaatc tataatcaaa gcttttctta tgtaaaacgt ttaggaacca atatggggaa 240
tttgcgttac tttgatcgaa cgaaagatag tgtcaattat cggacttttg tggaaggttt 300
cccagtgttc agtaatgatt taaaaggcca agtggatatt cgcatacga acaacgatgg 360

tgctgcacca agcgtaacca ttaacacaag tgtgaatacg atccaagtgc cgattccttc 420
 agaagaagaa gtgacgctgg aaagcacgga aaaattgatt aagcgtttag aaacggctgg 480
 tgctaaaaag gaaaaaattc aatcggctgt tatcggttat acgtggcaga caat 534

<210> 375
 <211> 547
 <212> DNA
 <213> Enterococcus faecalis

<400> 375
 gagcaacgtc tcttcttcca gccaaacaga atcgattgaa agtcgggttg aaaaagataa 60
 catctcgtat aaagggacac tttcttcaga acgattggaa gggtattatt taagtggcga 120
 acaaaccaat tttctgctg ctttaaaaat ccaacgtgaa aagaataaaa attttttgag 180
 aaatgggctg caaattgcgg ataatacttt aacgagtgt cctagtataa actattttat 240
 tgatcctaag aaaattgata aagatttaag taccttttta aatgaaaaaa atgctttatt 300
 attcggagac gaatatcaat acttaccaga attttctcat ttaaaagagc cgacggcaga 360
 aattgtggct gcacaatcgt ataaaggaat tcctttttaga gacgacacgg caaaattaag 420
 tatttttagca gattcgtcag gtgaattatg gcaaattagt aaatattcgc aaacgcacat 480
 tgaaaatatt gaagagttac gagacaaaac ggatttatat tccaatcgtg atgcgataga 540
 cacgctc 547

<210> 376
 <211> 224
 <212> DNA
 <213> Enterococcus faecalis

<400> 376
 ttcacgcgaa taatcgttcc tttgttggtc taacggatac aggttattgt agcgatcata 60
 ttcgtggtac gattgaaaat gcagatgctt atttagtcga aagcaatcat gaaattgaaa 120
 ttttgcgagc aggaccttat ccatggagtc ttaaacaacg gattttagga gataaaggcc 180
 atttatccaa tgatgatggg gctcttggtg tggcggatgt gtta 224

<210> 377
 <211> 500
 <212> DNA
 <213> Enterococcus faecium

<400> 377

tcttcatttg ttgaatatgc tgttttaagt attcgatgcg atattcatca tgtatgtttt 60
tatcatctgt caaaacatct atggcaccta atccattttc tgtaattatg atagggagtc 120
catattttct ataagtgtaa ttcagcagat accgtaaacc cgtcggatca atgggtccatc 180
cccatttact agtcacaaga tacgggtttt gaagaccgcc aaataaggca ctcttttctt 240
cagctgctcc ttcgtacttc gcaacagatg atgcataata gttcatacca ataaaatcaa 300
gtgttccttt agagaacata tatttatcat tctctgttat ggtcaacttt attccttggt 360
ctgcatattc attgatttta tagtctggaa actttcctgt gcacatagca tctatttgat 420
agaaatctcg atccatttgt ttaaaagcat tcatcacatt tgttggattg caatctactg 480
gataaacagg ttcgattcca 500

<210> 378
<211> 665
<212> DNA
<213> Enterococcus faecium

<400> 378
attattgtcg cctctttccg ctacgcgatt aacatgaatc atcaaataag tgtattcatc 60
ttgagataaa taggtgttga actttccttt tacatatatt tctatctttt ctacagctgt 120
atatgcttta gggatatagt tttttacttg ttcaaataac tgagattcat tttcaacgta 180
tgcttggttt tttcttaatc gttcaataaa atactgtaaa tgtgtcacta gcctcatgta 240
gttgatgctc tcttcgtcaa tagataaact aaaatgatat ttgatgatat tcaacatgct 300
tcttagtgct tccatatctt ctatctgttc atcaaaattg acctgatatt cttgaagatt 360
aacaaagtgt aaggcaattg aaacagcttc atctgtggga aaggaaatgat taaaatattt 420
cttcatcatt tttaaagctt ccaaaccgat tttgtaataa actggataaa actttttaac 480
ttcccaaaag agcggacttc taagatattg tcctttttct gagcgtttca atgcaaagga 540
gagatgatct aataaagcta aataaagata atcatttgct tttttaccga tttccttttc 600
tccataacta acgagctcgt tgatcataga gatcagtcta tcatcagaat gcgataacaa 660
atagc 665

<210> 379
<211> 504
<212> DNA
<213> Enterococcus faecium

<400> 379

ctcctgatcc tcttcttggtg cagggacgcc taagagataa gcagctacag ctgatccagc 60
aaaactaatc acgactgccg ctaacataaa ccagaagttc atgaaatctc cttcacctat 120
atacgttggg aggccaaata aaccccaagc aacagaataa gctttaacac tagtcaaacc 180
agcaaataat ccaccaagtc ctcctccaat cattactgca acaaatggtc gacgatattt 240
aacaagaca ccatagatag caggttcagt cacaccaagt actgcagaaa gtgttactgt 300
cccaaataat tgtttttgtt ttaaattccg tgttcttaag aaatacccaa gcattgctcc 360
cccaacagca atatctgaga ttgtacatga agatataaat gcaggggtcat acccatttgc 420
tgcaattaga gaagctacaa ccggcatgat aaagtttcct gcgccaaca ttataataaa 480
tggttgaaga gcagagtata acat 504

<210> 380
<211> 555
<212> DNA
<213> Enterococcus faecium

<400> 380
cggatgaagg aagtaaagaa aagttgtcag tcgtggctac caattcgatc ttggcggaca 60
tggcaaaaga agtaggtaca atagatatcc acagtatccc gttcgggaaca gatccgcatg 120
aatatgaacc attaccagaa gacatcaaaa aggcaagtgg tgcagatggt attttataca 180
acggtttgaa tcttgaaaca ggtaacagct ggttcgataa cttgatggaa acggctaaaa 240
aagaagggaag agattatttt gcagtttagca aaaatgtaga acctctatat ttaactagcg 300
gtgaagaaca taaaaagca gatccccacg catggctaga cctatctaac ggaataaaat 360
atgtggagga aatcgcacgt atattctctg aaaaagatgc agaaaatgcg acactctata 420
aaaaaaatgc agaagcatat gtggaaaaac taaaagaatt agatacccca gccaaggga 480
cttttgcttc tatcgaagag aacaaaaaat tattagtaac aagtgaact gctttcaagt 540
atttacgagc atatg 555

<210> 381
<211> 401
<212> DNA
<213> Enterococcus faecium

<400> 381
aaagcgattt gttgctgaca gcactcgta gtggaatcgt cttgatattt gtctttttct 60
tttataaaga attgaagatc acatctttgg atccgacaat ggcaaaggct ttttggctga 120

acacttggtt gatccattat cttttgatgt tctttttgac attagtggct gtagtcagtt 180
tacagacagt aggaacaatc ttggtgattg ccatgttgat cacaccagcc gccacggctt 240
acttgctaac gaaccattta ctgaaaatga tcattacagc tgcaggaatc ggtatgctaa 300
gtgcagttgt cggtgtgttt ttcagtatag ttacattggc catcagagct acgatcgtgt 360
tagcatgtac cgcatttttt atccttgcta atttaatttt c 401

<210> 382
<211> 507
<212> DNA
<213> Enterococcus faecium

<400> 382
agccggtaaa ctcagtccgt aaaaaaatag cctacgtgga acaacgaagt gaattggatc 60
tttcctttcc agtgatggta ataggcggtg tacttttagg aacatatcca tctttacgaa 120
ttggacaaag acctgggaaa cctggaaaag aacgtgcaag acaagctttg aaaaaagtag 180
ggttggaaga atatgccaaa agacagatca gcgaactatc ggggtggacag ctccagagag 240
tttttattgc aagagctcta gcccaaggag cagaatggat ctttttagat gaaccattcg 300
tagggattga tgcgttaagt gaacgaaaga tctttgacat cttgcaggaa ttgaagaatt 360
caggaaaaac gattttgatc gtccatcatt ttcttcataa agtagacgaa tatttcgatg 420
aggttattct tgtaaataaa cagctgatcg cttccgggtcc agtacaagag tcttttacat 480
cagaagacct tcaattgcct tatgggtg 507

<210> 383
<211> 456
<212> DNA
<213> Enterococcus faecium

<400> 383
attactcgtt tcccctgaca gttggcagga catgctgatc gtagacaagg tttctaaaga 60
cggtatcgaa gcaaatatgg cagtcatgtc gcaaaaagga ttgattggcc gagtgatcga 120
ggccaatacg gcttcgtcta aaatcgaatt actgtcatcc tctaataaaa gctccaatca 180
ttttccagta cgggtatctt cggctaattg cgaagcgttt ggtttgctta aaaactatga 240
tgaaaagctc catgccttag tggtgacca attaactggg gatacggata tcaaagaagg 300
ggatgttgtc cagacatccg gtcttgaggg gaattctcca gctaacttgc cgatcggtac 360
ggttattaaa acgaaaccag atagttatgg gctggatcgg gaagtttatg tgaaacctta 420

tgcagaaatg tatgacgtgt cagttgtgac gattgt 456

<210> 384
<211> 500
<212> DNA
<213> Enterococcus faecium

<400> 384
atgttgaaga aagaaacaat gaagtactat ctgccaatcg ttttgttctt tttgatgttg 60
atagatggtc atttaacaag aatgctaggg gagtggtcga aaggcaccta tatgtcaaata 120
gcccaactttc tgatattggc attattatgt tgcagtatgg cgtttgaaaa acgttattta 180
ctgattacca cgattgttct cggggctatc tatgacgctt actatattgg cgttatcggt 240
atctatgcag tagctctccc ttttaattgta tggttgatgt atgtaatgaa agacgttatc 300
catgtcaaca tctttactga atttttcagt atgatcatct ttgtcacggg ttatgaattg 360
tttacgatgg tgggtccagtt gattttttaa ttagcagtag taaataacac gtattttatt 420
acaaggtttt taggacctac actgctgttg aacatgatta tatttgtatt attcattttt 480
ccctttaaga aattattcag 500

<210> 385
<211> 507
<212> DNA
<213> Enterococcus faecium

<400> 385
tcagtcagtt tcttgacctt tttcgtaaag aagccggcct ctcactaaaa gcttcagtaa 60
tcagtcagaa tttcgttcct accgcagctg gattagcctc ctctgccagc gggctagctg 120
cttttagcagg agcttgcaat actgctctta agcttggatt agacgatctc tctctttcaa 180
gatttgctcg acgcgggtct ggttcagctt gccgaagtat tttcgggtgg ttcgtcgaat 240
gggaaaaagg ccatgacgac ttaagttctt acgctaagcc agtcccttcc gattctttcg 300
aagacgattt agcaatgggt ttcgttttga tcaacgacca gaaaaaagaa gtgtccagca 360
gaaatgggat gcgtcggaca gtcgaaacat ccaattttta tcaaggctgg ttagattccg 420
ttgaagggga tctatatcaa ttgaaacaag caatcaaaac aaaagatttc caacttctcg 480
gagaaacgat ggaaagaaac ggactaa 507

<210> 386
<211> 508
<212> DNA

<213> Enterococcus faecium

<400> 386

ccaattaggt gaagcagaac ttgtgatagc cggcggaaca gagagtatgt ctcaagcacc	60
tatgctgaaa ccgtatcagt cagaaacaaa tgaatatggt gaaccaattt ccagtatggt	120
caacgacgga ttgactgacg cattttcaaa tgcacatatg ggattaaccg cagagaaggt	180
tgcaacacaa ttttctgtga gcagagaaga acaggatcgc tatgccttgt cgtcccagtt	240
gaaagcagca catgctgtcg aagccggtgt attttctgag gagatcatcc cagtcaagat	300
ttctgatgaa gacgtgttat ctgaggatga agcagttcgt ggaaatagta cattggaaaa	360
actgggcacg ttacgtacag tattctcaga agaaggaact gtaacagcag gaaatgcttc	420
cccgttgaat gacggtgcct ctgtggtgat ccttgcaccc aaagaatacg cagaaaataa	480
taatctgcct tatttagcaa ccatcaaa	508

<210> 387

<211> 501

<212> DNA

<213> Enterococcus faecium

<400> 387

gattgccttt cctttctatg caacaaaagt caccgcattc cttgaagagc tggatgcaat	60
ggacgatcaa ctggtttctt cctactattc aggaaattta gccgaagctc ctcatgcatt	120
aaaaaatatc aaaaaattat tcattcactt aaaaaaacag catgacatcc aaaaaaactt	180
gcaactgacc attgaaagca cgattcctgc tgaacgtgga atgggatcaa gcgctgcagt	240
cgccacagca gtcactcgtg ctttttatga ttacttagca tttcctttgt ctcgtgaaat	300
actattagaa aatgtccagc ttctggaaaa aatcgccac ggtaatccta gtggaatcga	360
tgcagccgct actagcagct tgcagccgat ttattttaca aaagggcatc ctttcgacta	420
cttttctttg aacatcgatg cttttttgat tgtcgtgat acaggaatca aaggacaaac	480
aagagaagcc gtcaaagatg t	501

<210> 388

<211> 505

<212> DNA

<213> Enterococcus faecium

<400> 388

caagaacaag aaactcagca ttctatcagt gagttacttg ccctggattg gccaggtcta	60
tccattgagc cattgattgc tcctgaagat ttacgtttat tgattgggtg gacgggtagc	120

cctgcctcta cttctgattt ggtcgatcaa gttcacccgtt cgagagaaga taaaatggtg 180
gcttatcagc ttttcttaaa aaacagtaca gaatgtgtca atgaaatgat caaaggggtt 240
aaagaaaata atgtaacgtt gattcaacag atgattcgaa aaaaccgaca attactgcat 300
gatttatctg caatcactgg ggtcgtcatc gaaacgcctg ctttgaacaa attgtgtaat 360
ttagctgaac agtatgaagg agccgcaaaa tcttctgggtg cagggtggggg cgattgcgga 420
atcgtaattg ttgaccagaa atctggcatt cttcctttta tgagtgcatt ggaaaaagca 480
gaaatcactc cactgccgtt acatg 505

<210> 389
<211> 585
<212> DNA
<213> Enterococcus faecium

<400> 389
aaattcactt actgcaccag agccgtagct gaatagaccg atgcgatctc ctggctgtag 60
tgatttcgaa ttttccagta gagaagttag cccaggtat aatgaaccag tgtaaagatt 120
accgattcgt cggctgtaac ggatgctttc ttcatagcga gccataagac gttcctgatt 180
atcttcgtct gtttggtcta atacgctttg caatgccttt tttcccatct tagtatacgg 240
aatatggaaa gcaatcgctt gataatcttc gagtcctcga cccgacaatt ctttatgtcg 300
attccaaact ttttggaatg attcgatata cgtagaatta gataaaggac catcaacaac 360
aggaaattcg ctataatctg gacgccagaa atcatagata tcttctgtca gaaatacgct 420
gtcgtcttca atcgataaaa tacgcggggtt ttgagtgatc atcatcgcaa cagcaccgac 480
accttgcgtc acttcaccac cgcttgccaa gccgtaacga gcaatatcac ttgctatgac 540
tagtactttt cgttctggat gatttttgac atattctttc gccat 585

<210> 390
<211> 300
<212> DNA
<213> Enterococcus faecium

<400> 390
gcatatttcg cttgatatat aggttcatac gtggtggaac aacgtatgat gttttaggaa 60
atagttgtga taaatcacgt ggtctactca catttgtaat atcataccgc ttttttgctt 120
caggagaaga agctctaata tcaatcctaa accagtattg tcagcgcgac tcataacaac 180
aagttctggt gttaatggat caaaatttct ttctatacac tcgatactcg cataaaaagg 240

cttcatgtcg attagaaaat aatcatttac tgattctttc gaataatcca gcatgaataa 300

<210> 391
<211> 273
<212> DNA
<213> Enterococcus faecium

<400> 391
atatttcac .cccagctctt tttttactaa tataccaact acatttaata acaaaataac 60
tagtaaactt aatattttta gtggcataga atattcaaaa ataaataaag gcaccataca 120
tgtagctatc aatataaata cagaacttac gtattttatt attttacgga acattataac 180
ctattacaac tccgcaaata gccatagccc ataccataga taagattttt accagcacca 240
ccaccacatg tttgttttat ctctttcata ctt 273

<210> 392
<211> 626
<212> DNA
<213> Enterococcus faecium

<400> 392
agcagttccg gtatctcttt ttttctcaga atattatttc tatgtgcttt gttacaatcc 60
attttctttc aaaaaatagc atcatttata atatggttct ccgtatcgcg agcgaatggt 120
attggctaatt ctcttgga acaagtgttc accacaaaat tcttaactaa acaaaaaata 180
gcataaatta atgctcttag tcacagatca tactgtaaca gtatgatctt attttctgac 240
aaaataagaa taccaatcat ttatggtacg acattctaag cgtaaagat tgatattctt 300
ttgcagaaac attcttaatt tgtacctaaa gattgctgac taaaaaatag atagaaaatt 360
ttcttcactc tatttaatac gttgcttgaa gttttatagt tatctattaa cattctcgtc 420
ccctattgtc ggggataggt ttcgattaga tgaactcgaa aacgttgcta tatcaattat 480
ggaaacatta ttctctgtcc agtgatggga caatccatac tcttccaatt agttatttgg 540
tcgattcacg ggaaaaattt tatatgcagt tcattattac tactcatctt cagactgtac 600
cgattcaaaa cattaccctt tcttca 626

<210> 393
<211> 508
<212> DNA
<213> Enterococcus faecium

<400> 393

tgaagtcctt tgtctttgtt gcttagtacg ctccggattt cttctttttg tcaaggatga 60
aatgattttt tcaaaggatt ttggattttc attgtatcta ttatccaaaa tgttttgaat 120
gtttaacact aatgtcataa ctaataatgg cttattgcta gcgtctatcg aagtattttt 180
tatttccttc aatatcaatg tcatagagat agacatttaa aatctgcgac attttcaccg 240
ggatttagcc catctttttc gtcaattttt ggattctttt ttagtttcta ttggaaagaa 300
tcttcaactg acataattca ttttgtattt ttatctgtcc tcttaacatt ttagtgtcaa 360
ttttaatagt gcttcacacg agaaaggat aaacatacca ataaatttgg tatgactaat 420
gaaccttgca ctgcatagta tagccatacg cggatatact atatctctta tgttccttag 480
agtaaaacct ctaaatcggt gtgtattg 508

<210> 394
<211> 321
<212> DNA
<213> Enterococcus faecium

<400> 394
tctattaaac agacacaact tatctatggg ggtaccactc atagtggaaa atattatgga 60
aatggagtgt attgcactaa aaataaatgt acggctcgatt gggccaaggc aactacttgt 120
attgcaggaa tgtctatagg tggtttttta ggtggagcaa ttccaggga gtgctaaaat 180
gaaaaaaaaat gctaagcaaa ttgttcatga attatataat gatatatcta taagtaaaga 240
tcctaaatat tctgatattc ttgaggtttt acaaaaggta tatttaaaat tagaaaaaca 300
aaaatatgaa ttagatcccg g 321

<210> 395
<211> 613
<212> DNA
<213> Enterococcus faecium

<400> 395
ttcataagga cgatgtgttg gttagattgg attgttcttt aatagagaat gaaaaggctc 60
agatagaaca agaaaaccaa cgtattactc aacaaataaa gatggctcag ctattttattg 120
aaagtataag taaaggaaaa aatttgtttt caacggatga cagttttggc tacagtaatc 180
aattaaagag catgttgtca gaaaaagaat cactccgcta cgctttgaag caaagtgaat 240
taaagatca aaagcaatta gaagtatacg aaaagacaaa aagacaacta gaaaaacaaa 300
ttgagagttc agatagtaaa ttacaagaat ggcaacaagt acaggtagct tggagtaata 360

atcaatcatt aaaagatttt tcaaaagaaa tgatggcaaa ctatgagaat tggcaagaac 420
aactaaataa tgtttctgat gatcaaaaaa atcaagtga actgacaatt tcagcaagca 480
taaatagaaca aattgagcaa ctaaaaaaag aagtagaaca gtatcagtca gaaaaagcta 540
aattagttaa accaactact tctgagaatg acagaattag tcaaacggaa aaaggaaagc 600
aagagctaga aca 613

<210> 396
<211> 400
<212> DNA
<213> Enterococcus faecium

<400> 396
attatgtgaa gatcaaatta tacaattaaa tcagttagaa cgaattattg ataatttcat 60
tctttttcac gataaagtat ttaagatagt attgaaaaca caaagtccgt tagaagttaa 120
aaaatacctc aaacaattcc gaccaaagca aggaatatat ttcttagata ttgatttaaa 180
tcatgaagtt aacggtatag aattagcaga agtaatcaga aaatatgatg ttcaagcaaa 240
aatcattttt acaactactc atgatgagat gttaccgta acaataaaaa gaagagttga 300
aacgtagga tttgtaacaa aagatcaaac actagatgag tatcgaaacg agattggtga 360
gttattgtta ttagcgcaag aaaggataga tgcaacaaaa 400

<210> 397
<211> 533
<212> DNA
<213> Enterococcus faecium

<400> 397
atcttgatct tgccattcca ttttttcttt accgaaaaga ttagcttttc tagtcaagta 60
attaacaagg gggtgtttgt ttttctggat tgtatccac atgacagaca atgtttcttt 120
cttcaaccga ttgtactcta atggtttttg tagaaaatct gtgacaccat gaagttcata 180
gtcagaaagt ctaaaaccat ctaaattgatt caaagtatcc gtgaagaggg gtgccttttc 240
ttccaggct tcttcccatg ctgcgaaaag tgtttctctg acttttggat ctggatcgcc 300
catcatctta ttgaaggctt gtccagcaga taattcgact acttgtccat cttgttcgaa 360
gggaatcgaa atgctggcta caatcgatc ataatgactg ctccaagcat ttagaccatc 420
taaagaaagc gtatttataa tgttttcttc agcttctgat aataattgtg agccatcacg 480
acgaatctcg tttaaacgaa aagcaattgt ttcaaacgaa gattgagaaa gca 533

<210> 398
<211> 171
<212> DNA
<213> *Enterococcus faecium*

<400> 398
tgaatcttca gcaacagaag aatcaacaac agtgccctgaa tcttcaacaa cagaagaatc 60
aacaacacct gcgcctacaa caccatcaac agatcaaagt gttgatacag gaaacggcac 120
aggaagtagt actccggctc caacgccaac accaacacct gaacaaccaa a 171

<210> 399
<211> 519
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 399
aggatcattt gtctcctacg gcccgccactg ggccaacgctc agcaacgccc cctacgccaa 60
ttatcacaaa accaccagcg cccagggcg g catcaatacc gactttatga tctccgggtcc 120
cgggatcacc cgccacggta aaatcgacgc ctcgacgatg gcggtgtatg acgtggcgcc 180
gacgctatat gaattcgccg gcatcgatcc gaacaagtcg ctggcgaaaa agccggtgtt 240
gccgatgatc ggcgtcagct ttaagcgcta tctcaccggc gaagtacagg agccgccgcg 300
cggcaactac ggggttgaac tgcattcatca ggcggcctgg gtcgatggcg aatggaagct 360
gcgacggctg gtgccgcgcg gcctcaccgc cggcgacgcg ccgtggcagc tgtttaatct 420
gcacgacgac ccgctggaga cgcattgatgt cgcggccgaa catcccgatc ggggtcaaagc 480
catgagcgag gcctacgagg catttgctaa gcgcacccat 519

<210> 400
<211> 320
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 400
ctgatcaacg acgcatgggtg ccgactgttc cgcgaacatg gctttattat cgggttgagc 60
ctcgaaggca acgaagcgct gcaggactac catcgtccgg ataaacgcgg ccggtcgacc 120
tggtcggcag cgctgcgcgg cattgacctg ctccatcagc atcaagtggg ctttaatctg 180
ctggtgggtg tgcataacga gatggcgggc cagcgggcg cgatttatga ccggctggtc 240
agcctcggcg cgcgtatctt gcagtttcag ccgctgatga gcgaaggcgc ggccctgcgc 300
gaaggatacc agctcagcgc 320

<210> 401
<211> 201
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 401
ccgacgcgagt ccattacccc ggagattgtc gacaaagtct acaacatcaa cgtcaaaggg 60
gtgatctggg gcatccaggc ggcggtcgag gcctttaaga aagaggggtca cggcgggaaa 120
atcatcaacg cctgttccca ggcgggccac gtcggtaacc cggagctggc ggtgtatagc 180
tcgagtaaatt tcgccgtacg c 201

<210> 402
<211> 305
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 402
gcctgcttcg ttgatagatt acctaccgcc ctttcgcaca acgaatggat ctcgatcgtg 60
gggaatctac ttgataacgc ctacaatgcc agcctgcgtc aaccgcaggg ttcaaaacag 120
atcgaatgcc tgatcaacag tgatggccag gaggtgatca ttgagatcgc cgaccaggga 180
tgccggcattg acgaggcgct gcgcgatcgg atcttcgagc gcggcgctcac cagcagcgcc 240
agcaaagatc atggtatcgg actctggcta gtacgcagct acgtggaaca agcaggcggc 300
agtat 305

<210> 403
<211> 608
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 403
gccaccttta ttccttcgcg gctgggccac tatgggtctgc tgcctgacgt ggttattgaa 60
tccacgacca aattctataa atccactaac atcctctatc tctatatctg ctgcatcatt 120
gtcggcagca tcatgagtat gaaccgcacc acgctgattc agggctttct gaagatcttc 180
ttcccgatgc tgtgcggcga agtggtcggc atgctgggtg gcatcggcgt cggcacgctg 240
ctgggcatgg agccgttcca ggtgttcttc tttatcgtgc tgccgattat ggccggcggc 300
gtgggagagg gggcgatccc gctgtcaatg ggttatgccg cgctgatgca tatggagcag 360
ggcgtggccc tgggcccgggt attgccgatg gtgatgcttg gcagcctgac ggcgatcgtc 420

atctccggct gcctcaacca gctcggcaag cgcttcccgc atctgaccgg cgaagggcaa 480
 ctgatgccga accgcagcca tgaaacccgc agcctcagcg agagcgaagg cgtgagcggc 540
 aagaccgacg ttgggaccct cgcctccggc gcgctgctgg cggctactgct gtatatgatg 600
 gggatgct 608

<210> 404
 <211> 490
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 404
 gtcagcatcg aggcattgct ggcggcgaaa gagcagcgtg cagcccgcca ggccgactgg 60
 ttggcccatt atcagcagcc tggtatttcc ctgaccctgg tgaccccggg ggcgggtgaag 120
 gacagcattc gctatcgtaa tatgatgggc gttgccctcc aggcctgcga tcagctgctg 180
 tggaagcacc gctggcaaac gctggatcgt cagggtgctat ggctgccgac cgggccagaa 240
 gcgctgtggt gcgtagcgca tccggccagc gaaatcaaag cgatgtgcag tacgctggag 300
 cagatccatc cgctgggacg cctgtgggat atcgatgtaa tctgtccgca gaacgggctg 360
 gtgggacgcc agtcgctggg cgaatcgag cgccgctgcc tgctgtgcga tgagccggcg 420
 cacgcctgtg cgcgcagccg tcgtcacgac accgatctcg tcgtcgcccg cgttgagcag 480
 atgattgacg 490

<210> 405
 <211> 509
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 405
 gttgttctcc actaccact ggataaaggc ctccccatc accggcgctt tgtcatcaat 60
 tccggcttgc gctttgatgc gggccggcag atcggccgcc ggacgcgggg tgatgcggtc 120
 caccatggtg ttcggacagg tggattggc cgccatccag tcaatcaccg cctgtttgcc 180
 ggtgagctgc aggaactcga ccataccgtc gtggaaacgc tcgccgttat ggcgcacgct 240
 atcgagttg agcaggggtc gcggcccggc gttgtcggcc atgcgctttt ccaggatccg 300
 cgcgaggggt ccgtaaatgg ttttgactc gccttgacag tcggcctgca gatcgggggt 360
 gctggtttcc agccgatggc gagtggtcag gtagtacccc ccttccgtca cggtaaaggc 420
 gataactttg gtctgcgggt ttgccccttc gttaatcagc ggctgtagcc cggcctgcca 480

cggtagcagt ttctggattg aggtgatct 509

<210> 406
<211> 533
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 406
gacttccggt ttttcacaca ccgcggcaat gggtttgccc gccgccaggc aggccagccg 60
cgccgcgccc agcgcgcgcg cggtctctcc gcctttgtgg gtcaccaccg gcatagcgag 120
aatatcggcc agcagctggg ccagaaacgg gctgcgggcg ccccgccca ccagcgagca 180
ctgcgcgacg ggcgtccgcg tctctttcaa tgctgcagg ccgtcgttga tcccaaagct 240
caccctctcc agcaccgcgt agccgagctg cgcgcgcagg ctggcgtggg tcatgcccc 300
gaagatgccg cgcgcgtcag gatcggttatg cgggggttcgt tccccggaga gatagggcag 360
gaagaacggc gcgttggttt tctctctctc gcttagctcg gcaatctccg ccagcagcgc 420
cacctccgtg gtgcgggtca agcggcagaa ccaactgcaaa cagctggcgg cgtcagcat 480
gacgctcatc tgggtgccaca ggttcggcag cacgtgacaa aacgcatgta ccg 533

<210> 407
<211> 260
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 407
ccagctcgga aaactttctca cgggtggtga gattctgcat atgctgcggc gtttgaatat 60
ggcgcagggg aaccagggca atcacgcccc cggttaaggca gaaggccagc gccagccaca 120
gggtgccccat ttcgccaatg tgaggaatgg taaagctcgg aatatagctg ccgaagacct 180
cgatgccgat ggaatacacc gcccagaacc agccgatggc cgagctggcg ttgtcgcttt 240
tgacgttatg gacaatcgcc 260

<210> 408
<211> 501
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 408
taacggcaaa gacgctaaaa accggcaacg tcggtgtctc ttttacgggc gatggtggtt 60
ctaatacagg cctggtcttt gaagccatca atatggcgt cgtgctccag ctccagccg 120
tctttatctt cgagaataac ggttacggcg aaggaaccgg ccatgactac gccgtgggtg 180

ggcgtgatat cgcccggcgc gccgctggct tcggcctgcc ggcagtgacc gtcgatggca 240
ccgattttctt tgccgtttat gaggcaacct cagaggcggt caagcgtgcg cgagaaggcg 300
gtggcccaag cgtcattgag gccaaagcct tccgctggca tggtcatttt gagggcgatc 360
ccgcgctata tcgtgcggaa ggtgaagtgc aacgcctgcg tgaacaacat gatccgctga 420
agattttcac cgctaaggtc aagcaacata tcaccagga agaactggcg gcgattgacg 480
aggaagtaga agccctggtc a 501

<210> 409
<211> 535
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 409
cctataatat ctttgccacc acgcctggac tgaaggtggt ggtgccctcg acgccttatg 60
acgtcaaggg tctgttaatc cagtccattc gcgacgacga cccggtggta ttctgcgagc 120
ataaaatgct gtacgacctc aagggcgagg taccggacga gatctatacc atcccgctag 180
gtgtagccaa ctacactcgc gaaggggagg acgtcaccat cattgcgttg tcggcaatgg 240
tacataaagc aaaccagggtg gcggacaaac tggccagaga ggggatctcg gtcgaggtgg 300
tcgacccgcg aaccatttcg ccgctggatg aggaaggat tctggaatcg gtggcgacca 360
cggggcgggg cgtgattgtc gacgaatccg ctgcacgctt cggttttgct catgatgtcg 420
cggcgctgat tgcgtcccag gcattccatt tcctcaaagc gcccgttctg ctggtgacgc 480
cgccacacac gccggtcccc ttctccctcg ctctcgaaaa actctggatc cctgg 535

<210> 410
<211> 543
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 410
gcttgaaatg ccaaagtggg ggctttccat ggaggaaggc ttgctcgctc gatgggcaat 60
ccaggagggt gacgatttca ccagagggca ggaaatatgt gagattgaaa ccagtaaaat 120
cgtcaatgtg ctggaggccc cttttgccgg tacgttacgt cggatactcg cccgcgaggg 180
tgagacgctt caggtaggcg ccgtgctggc cctggcggtc gacgcgtcgg tcagcgatgc 240
tgaactggac gaatttggtg cccgcctggc gacggcgaaa cccgcagccc caggcccggg 300
ggctgccgcg ccggacgtag cggcacaggc aggcgctaag ccagcttccg ttgtttcgcc 360

gccatccaac agccccgagc cccctgttgg gcagaccgtc atccccgtca gtctgcaagg 420
tgtgaccgat gtgactcagg ttaatgccac gcccacatgcg ttacgactgt ctgcccgtcg 480
gggtgtcgac ctgaaaaaag tcgcggcagc gggcgcgggg atcgtatctc tgtttctgat 540
ctg 543

<210> 411
<211> 596
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 411
cagtcaggaa cacagcattg tcgatatcag catatccgga tgaatcaggg cgtgggagag 60
cattatgaga tccctgtccc ctggtttctg ctgacccatc cggatgggtt tacgctgatt 120
gacggcggtc tggctgtcga aggattgaaa gatcccagcg gttattgggg aagtactgta 180
gagcagttta aaccggtgat gtcagaagaa cagggttgcg tggaacaact taagaggatt 240
ggcattgctc ctgaggatat ccgctatgtg gtccctgtccc atttgcactc tgatcatacg 300
ggagcaattg gtcgcttccc ccatgctacg catgttgctc agaggcaaga gtatgaatat 360
gcctttgccc ctgactgggt tacttcggga gcctattgcc gacgcgattt cgatcgtccc 420
caacttaact ggctatttct gaacgggttg tccgatgatc actatgacct ttacgggtgat 480
ggcacgttac aatgtatttt caccocaggg cattcaccgg gccatcaatc ttttcttatac 540
cgcttacagg gtggtacaaa ttttacgcta gcgattgatg cggcttatac cttaga 596

<210> 412
<211> 693
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 412
ccgttaccca tgttgattct gagccgcagc ccggccatct ggctgtggca aacgctgctc 60
tatcagggtga gtcacccgga tcgtctgcgc aacgtccata ctgccccgcg cgatctgtcc 120
tgccgaggagc tggcccatcg gctggagaat gcgccgcggc ttgagcggct tgccggcgaa 180
gccgccctga tccacggaaa acgggtcgct gggttgacct acgccgagct caaggatgatc 240
ctcgccctgc tgcaagggca gacgataggc gagcaggccc aacgtctcgg attgagccag 300
aaaacgctct acaccagcg gctggctggg gtgaaaaagc tgggtggaatg tcatccgcat 360
ctggccccc gctttccgcg cacgctgctg ccgcgctcac ccgcaaacgc actgacggcg 420

tttgaacagg aatgggtaca agcgattcac gatcgccagg tcttcccggg ttttcaacct 480
 atcgctcgata gtcgctcaca gctacagggg gtggagatcc tgatccgctg gcgccaccgc 540
 ggccaggtac ttcacccccca gacctttctg ccgcacttcc gcgccgacta cacctggctg 600
 ctgcttacgg cctttgttct gcaggaggcc gtgcagaata ttaatgagta tccaggcacc 660
 ttctatTTTT cggTcaacat accctcctca etc 693

<210> 413
 <211> 514
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 413
 ccgatcatga gaacatcagt attgaactgc agcgtgagtt ccttcctgag gaacgtgaag 60
 attacgctca tgtcttctat agcggccctc ttgacgcctt ctattcgta cagtacggtc 120
 ggttaggcta ccgcactctg gatttcgaaa aatttaccta tcaagggtgac tatcaggggt 180
 gcgctgtgat gaattattgc tccatcgatg tgccatatac acgcatcact gagcataagt 240
 atttttctcc atgggaaagc catgaagggt cggctctgcta taaagaatac agtcgcgctt 300
 gcggcgagaa tgatattcct tattacccca ttcgacagat gggggagatg gctttactgg 360
 aaaaatatct ttctcttgcc gaaagtga aaatattac cttcgtcggg cggttaggta 420
 cctatcggtat tcttgatatg gatgtaacca ttgcggaagc gctgaaaaca gccgatgagt 480
 ttttatcttc ggtggctaac caggaagaga tgcc 514

<210> 414
 <211> 584
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 414
 agagatgggc tgcaaactgc tgcagcgtac caccgcgaag ctgcgtctta gcgatgccgg 60
 ggaaacgata tatcagcatg ccagcagat gctggaagcg gcgcgacagg caatggattc 120
 cgcaggcagt cgccaaacgg tcgcccaggg aaagctgacg ctaagcgtcc cgaaagccgt 180
 cggccgcttt gtgatccacc cgctgatgat ggcgtttttc caccgctacc cgcagggtga 240
 cgtctgcctg cggctggaag atcgccctct cgattttatc gatgacggta ttgatctggc 300
 gctacgcac accgataccc cctcccccg cctgcatggc aaaccgctga tgccaatcag 360
 gcacgttatc tgcgccactg aggcctatct acagcagcac ggtacgccgt acacgccgca 420

ggatctgcgc gcgcatagct gcattagcct tggcgaaacg cccgccgatg cgcgctggaa 480
gttccgtcgg gaaggcaaaa cagaaacggg gcaaacctac gggcgggtacg ccgccaacca 540
taccgccgta cgcctcgacg cggtcagaca gcatttaggg atcg 584

<210> 415
<211> 281
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 415
acagattaca ttgtcatttc ctgccagccg cgccttgagc ggccgagcgc tggcaggagt 60
cgtgggttca ggcgatatgg aagtacttta taccgccgca cagagcgcca cgctcaacgt 120
acagatcacc acctcagtgg ataacagcca ggcgcgctgg caggcgctgt tcgacagggt 180
gaacctgata aacggcctgc ccgccgggca gttgattatc cagacttcg gcgccacgcc 240
gggcgctgcc cgtattcgta ttgaacagggt ttttgaggag g 281

<210> 416
<211> 656
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 416
atggattttg ccttaccgcg cacgctgttt agcgcgacgg taaaaacgcc gtgggcccggg 60
atcgtcgccc agtcgccgct ggtgctgggtg ttgaccggcg cgatgtggat cacctatgcc 120
gcgatctact tcctcgccac cagcgtgttc aaacgcacgc cgcaggatgc cgcggtgctg 180
accctcaccg tcgccctgcc aaactatgcc gcgttaggtc tgccgatcct cggcagcgtg 240
ctgggtgaag gcgcgtcaac ctcaactgtcg gtacgggtct ctatcgctg cggctcggta 300
ctgatgacct cgttctgcct gctgattctg gagcgtgaaa aagcccgcgc cgcgggtgaa 360
aacagcgggt ctacgctggc aatgctgccg gtgctgatgt ggcgttcggg gaaaaaacgc 420
atcgctctggg gcccgctgct tgggggtgggtg ctttccgcga tcggcattaa aatgccggac 480
ctgctgctgg cgtcgatcaa accgctgggc ctggccgcca ccgccgccgc gctgttcctc 540
accgggggtga tcctgtcggc gcgtaaactg cagctcaatg cgctgatcgc tacatcaacc 600
atcgtgaaac tgctgggtgca gccgtttatt gcctgggggtc tggatgatgtt acttgg 656

<210> 417
<211> 456

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 417

tatttacctt tcccggtcag ggcggccagc gtcccggcat gctggcgatg atccccgatc	60
gcgaggcgat cctcaccacg gcgcgcgcgc tgctggggga tgaagtcgat accctcgata	120
gcgccgatgc gctacaacac acccgtgcgg tccagctctg tctgctgate gccgggtgtcg	180
cctggggcgcg cgagctacag cgtcagggcg tggatccgca gatggtcagc ggcctctcta	240
tcggcgcggt tccggccgcg gtgattgccg gcgcgctcga tttcgccagc gcgctgcggc	300
tggtagccct gcgcggggac ttaatggaac aggcgtatcc tgaaggttac ggactgacgg	360
cgattatggg cctgaccgcg ccgcgggttg aggcgctgat gcagggcaac gaggtttatc	420
tcgccaatct gaacgccgaa acgcagttcg tgattg	456

<210> 418

<211> 537

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 418

tgctgctgat accaatgtag gcggcggtca ggttaatttc ttcggtaaag ttaccgacgt	60
atcttgtact gtttccgtaa acggccaggg cagcgatgcg aacgtttatc tgtcaccagt	120
gactttaacg gaagttaaag ctgccgcggc ggatacctat ctgaaaccga aatctttcac	180
catcgatggt tctgactgcc aggcggctga tggcaccaaa caggatgatg tgagcaaact	240
gggtgtgaac tggaccggcg gtaacctgct ggcggggcga accgctaaac agcagggcta	300
cctggctaac accgaagccg ccggcgcgca gaatatccag ctggttctct ccaccgataa	360
cgccaccgcg ctgaccaaca aaatcatccc gggcgacagc acccagccta aagcggccgg	420
tgatgcctct gccgttcagg atggcgcgcg cttcacttac tacgtcggct atgcgaccag	480
caccccgacc acggttacca ccggtgtggt taacagctac gcgacttacg aaattac	537

<210> 419

<211> 554

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 419

cgcaatacca taccttcacc gccacgatg ccgtggctta cgcgcaacag ttcgccggca	60
tcgacaaccc atctgagctg gtcagcgcgc aggaagtggg cgatggcaac ctcaatctgg	120

tgttttaaagt gttc gatcgt cagggcg tca gccggg cgat cgtcaa acag gccctgccct 180
acgtgcgctg cgtcggcgaa tcttgccgc tgacctcga ccgcgcccg tctgaagcgc 240
agaccctggg cgc cactat cagcacagcc cgcagcacac ggtaaaaatc catcactttg 300
atcccgagct ggcggtgatg gtgatggaag atctttccga ccaccgcac tggcgcgag 360
agcttatcgc taacgtctac tatccccagg cggcccgcca gcttgggcgc tatctggcgc 420
agggtgtgtt ccacaccagc gatttctacc tccatcccca cgagaaaaag gcgcaggtgg 480
cgcagtttat taaccggcg atgtgcgaga tcaccgagga tctgttcttt aacgaccgct 540
atcagatcca cgag 554

<210> 420
<211> 220
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 420
gtgcgtttta tctcctcaag ccagctcgcc agacgcgctt cggctctggc gaactgggta 60
tctgatcca gcaccagccc aacaaagcgg tcgccttcca gcgccgagga cgcgctgaat 120
tcataaccct catttgcca gctgccaatc atctgcgcgc cgcgcgcgct cagggcgctc 180
aacagcgggc gcatcccgct gacgaagttg tccggatagc 220

<210> 421
<211> 341
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 421
aaattgccga agctcaatct ggtgaccggc ttgaaacct atctcggcaa ctccgcgta 60
ttaaagcggg tgatggaaca gatggcggtg ccgtgcagcc tgcctccga tccgtcggaa 120
gttctcgaca cgc cgcga cggtcactat cggatgtatt ccggcggcac cacgcagcag 180
gagatgaaag aggccctga cgc catcga acgtgctcc tgcagccgtg gcagctgctg 240
aagagcaaaa aagtgggtgca ggagatgtgg aaccagcccg ccaccgaggt cgccattccg 300
ctggggctgg ccgccaccga tgaactgctg atgaccgtca g 341

<210> 422
<211> 400
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 422
agagagcgtc attgagcagt ggggtgccgcc ggcgccgcgc ccggctcagc gcaatcgccg 60
gggtcaatctg ctgggtcagcc atctctgttc gccggggcgat atcgagtggc tgcgccgatg 120
cgtcgaagcc tttgggtctgc agccgataat cctgccggac ctggcgcaat cgatggacgg 180
ccacctggcg cagggcgatt tctcgccgct gaccagggc gggacgccgc tgcgccagat 240
agagcagatg gggcaaagcc tgtgcagctt cgccattggc gtctcccttc atcgcgcttc 300
atcgctgctg gcccgcgct gccgcggcga gggtatcgcc ctgccgcacc tgatgaccct 360
cgaacgctgc gacgccttta ttcatacaact ggcgaaaatt 400

<210> 423
<211> 536
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 423
acagggttga tcctcgctga cattacgatg cgctttcctc ctggcgccag ttttcatacc 60
ttcacccatg ccctgctcgg acccgctgcc agcgtaatca tcggcggtggc tttctgtttc 120
gtactttatt tactgacctc cgcgtacata tcaggcgagc catcgatagt gtgggatctc 180
cttcctcccg atattgctgg ccgcagctgg ctgccgatca ttttgctgtc gctgacgacc 240
tcgctgattc tgtgggcccg cggcaaattg cccggttttc tcctctccgg ccttatcgcc 300
gccaaattca ccctttttct cctgctgttc gccggtgccg caggaggcgt aaaagtactc 360
agattactcg acttcgccgg cagcacgccg ctccagtatt acctgccgat cgtaccggtc 420
tgcgttatcg cttttggatt tcatggcagc gtcccctctc tgacaagaat gtaccggggg 480
gataatcatc gtgcggctct ccgctctctc tattacgggt tcgccgtttc attaac 536

<210> 424
<211> 282
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 424
aaaagacaag ctgttgctgt ttaccgccgc gctgggtggcg gagcgtcgcc tggcccgcgg 60
cctgaagctc aactatccgg agtccgtggc cctgatcagc gcctttatta tggaaggcgc 120
tcgggacggc aaaagcgtgg cctcgctgat ggaggaaggc cgacatgtcc tgaccgcgaa 180
gcaggtgatg gagggcgctc cggaaatgat cccgatatc caggtcgaag ccaccttccc 240
ggacggctcg aagctgggtc ccgttcacaa cccgattatc tg 282

<210> 425
<211> 587
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 425
atttcataaa ctcggattgg tatttttgatt tgcattggac cgaccgagca atagccgctc 60
gtgatgctgg ttatgagatt cacatcatta gtcattttgt tgatagtaaa ataaccaata 120
aattcaaadc gttaggggtt atctgtcata acgttccgct tgctgcccag tcattcaacg 180
tattttacttt tattcgagca ttctttgatt ctcggaaaat aattaaagaa atagaccggg 240
atctgctgca ctgcatcact ataaaacctt gtctaattgg cgggttcttt gcgaaaaaaa 300
cgcagcgtcc agttattttg agctttgttg gccttggtcg ggtgttttcg gaaaattccg 360
ggcttattaa actactacgg cattttacaa ttaaagcata caaacatatt gcgagtaata 420
aacgcagtat gtatatgttt gagcatgata aagatagaag gaaaattggt gattttctcg 480
gtattgatat ccagaaaacc attgtcattg atggtgccgg tatcaaccgg gaaatatata 540
aatattcggt ggaacaaaag cgagatatcc ctgtagtgct gtttgcc 587

<210> 426
<211> 320
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 426
aggttcaggt agctggaaaa acagtaagtc aagtagcaca agatattaca agccgattaa 60
ccacatatat tgaaagccct caagttgatg tcagcatagc tgcattccgg tcacaaaagg 120
tttatgtaac tgggtgaagt gcaaactctg gaaaacaggc tattacaaat attcccctaa 180
ctgtgatgga tgctatcaat gcggcaggag ggcttgccgg tgatgctgac tggagaaacg 240
ttgttcttac tcataacggg aaagatacaa agatttcatt atatgcacta atgcagaaag 300
gagatctaac ccagaatcat 320

<210> 427
<211> 280
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 427
tgattcaatt ttagtgatct gcacaggaaa tatctgccgt tctccaattg gtgagcggtt 60

attaagacgg ctattaccaa gcaaaaagat taattccgct ggggttgggg cattgggtga 120
tcatgcagca gatgaatccg caattcgcgt cgctgaaaaa aatgggtcttt gtctcaaagg 180
ccaccgtggg acaaaattta cctctgcatt agctcgacag tatgatcttt tactcgtgat 240
ggaatattct catctagaac aaattagccg gatagcacct 280

<210> 428
<211> 200
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 428
acatgatccc ggagaaattt agctggatta ttacttataa ccctctggcg agtatgatac 60
ttagctggcg tgagctattc atgaatgggg ttttaaacta tgaatatatc tccatactct 120
atattacagg ctttatacctg accatcgctg gcttggccat ctttaataaa ttaaaatatac 180
gatttgcaga gattttgtaa 200

<210> 429
<211> 387
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 429
tggaaccagt gatcaatttc agtaacgtta cgaaagaata tcctctttac catcatattg 60
gttcaggtat taaagactta gtctttcatc ccaagcgagc ttttcagctg cttaaaggga 120
ggaagtatct cgcgatcgag gatatactcat ttaccgtcgc caaagggtgag gcagttgcgc 180
tgattggggc aaacggcgca ggtaaaagca cttcgttagg actagtcgct ggcgtaataa 240
agccaacaaa aggctcgggtg actactcatg gccgagttgc ttcgatgctg gaactcggcg 300
gtggttttca tccagagtta acgggtcgtg aaaatattta tcttaatgcc acccttctcg 360
ggctgcggcg gaaggaagtt cagcagc 387

<210> 430
<211> 225
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 430
gggtgcatcc caaacctgct gggtcagcgc cacgttaccg ttcagcttct ggccgtagct 60
cggcacaata gcgtgaatgc ggctctgcc ctccggcgag ttaaactgct gcgggaacat 120
ctgcttgagc acgttcaggg tgattggcgc ggcggtggaa gccccggcg aagcgccgag 180

cagcgcggaa atggttttct gctgatcgac caccacttcg gtacc 225

<210> 431
<211> 690
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 431
cctgctgcta ttgctgtcgc tggtagcca ggaaaaccgc caggcgctgg ccggggtgtt 60
acgcgagcag tggcagacct ggacgtgct ggcggctttc tttatctatt acgccctcag 120
taatgtgtgg ggccatacgc cgcagcatat tgactcgccg atcaccacg gcgtgtatct 180
gaccgggtat ctgttgctga tgacgatgct gctcaggac ggacgaacc gccgactggc 240
gatgctggcg gtggtcggcg ggatcacctg gctctccctg tggacgtga ttatcgacca 300
tacgtgggt ctcaccgaac gagcggctct ccccgagaac cccggaccaa cgaacgttat 360
cgaccttgcc ggttactgcg gcatcggcat tttaatctgc ggcatgctac tgaaagaaaa 420
agccagccac tggctctatc tgccggtggc catcatgctg gtgatgctgc tgctcaccca 480
aagccgcggg ccgatcatcg ccttgggtgct ggcggtcggc tgtacgtgc acctgcacgt 540
cttcaccgc cgcaacctgc tgatcgccgc ggcgctggcc gtgctggtag cgctgctttt 600
ggatcatgac ccggtgggcg acatgctgct cggcgtttc gaggagctgg gcacccaaag 660
cgggctgcgc ctgagcatct ggcaccatac 690

<210> 432
<211> 211
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 432
aatttaacct ggtttgataa gaaaactgaa gagtttaaag gggaagagta ttctaaagac 60
tttggatgat atggttctgt cattgaaagt cttgggatgc ctttaaagga taatattaac 120
aatggttggt ttgatgtgaa aaatgagtgg gtttcattat tgcaacccta ctttaaacad 180
aaaatcaatc tttctgatag ttcataattt g 211

<210> 433
<211> 326
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 433

ggggagaata tccttgtctt taaacgcgcg ctgggggtga ccaccgggat cctgccgtgg 60
aacttcccgt tctttcttat cgcccgcaag ctggcgccgg ccctgatcac tggaaatacc 120
atcgtcatta agcccagcga atttacgcc aataatgcc tgcctttgc cgagattgtc 180
catcagggtg ggttgccgaa aggggtcttt aaccttgtgc ttggccgcgg agaaaccgtt 240
ggccaggagc tagccggcaa tccgaagggtg gcgatgggtca gcatgaccgg cagcgtggcg 300
gcgggagaaa aaattatggc cgctgc 326

<210> 434
<211> 465
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 434
gactcgcggg tgattaacac cgggcagggtg tgtaactgcg tcgagcgggt ctatgttcag 60
cagggaatat acgaccgctt cgtcaaccgc ctcggtgagg cgatgaaggc cgtccagttt 120
ggcgaccggg cgacgcgaga tgacatcgcg atggggccgc tgatcaacgc ggcggcgcg 180
gaccagggtg cgggcaaagt gcgaagcggg ggcgcagggg gcgcgggtgg cgctggcggg 240
cagccgctgg agggcaaagg ctatttttat ccgccgaccc tgctgctgga tgtacgtcag 300
gagatggaca ttatccatga ggaaaccttc ggtccgggtgc tgccgggtggg ggccttttcg 360
accctcgatg aggcgctggc gacggccaat gacagcgatt atggcctgac ctctcaatc 420
tataccgcg atctgaacgt ggcgatgaaa gcgattaagg gactg 465

<210> 435
<211> 465
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 435
atgaaacgac ctgattgcat tcgccactgg cgcgaactgg aagggccga cgatgccact 60
tatcccgaca gcccgagcg tttttcgatt ggcgcgcgcg tggggcgcgg ttacgtctc 120
aaccggttgg ggatccacca cgagcgactg ccgccggggc ggcgcacctc gtaccgcac 180
gcggagagcg atgaggaaga gttcatctac gtgctggagg gctatccgga agtgtggata 240
aacggctatc tctggaagct ggagccgggg gacagcgtgg gttttccgc gggtaaccgg 300
atctgccaca cttttctcaa taacaccgag caggagggtc gtctgctggg ggtgggcgag 360
gccaacaaga aatacaaccg catctattat ccgctcaatc caggctatgc cgcgacgcg 420

caggatcggtt ggggttgacca tccgccgcaa ttcttcgggtc cacac

465

<210> 436
<211> 270
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 436
ttgcgtatat agaagtcata ccatcggttcg taagcggcaa cattgataga ttcagatgct 60
tccagaagcc gggggatata ataaaccagt tcttcaaagg caatactgcc ttgagggata 120
tcagaacggc tcaggcgaca aagaaggtta atcgtgggtc gaaggatgat ccaactgctgt 180
gccggggagg atgggagggc gttcatgctt atcggaagtt catgaggaat taaagcaagg 240
atctgatttc cactggtaga cagctcacgc 270

<210> 437
<211> 406
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 437
gattcctgct ctgacaacca ttgttttaac catgaacgta gagtaacttc aggcacaggt 60
agcctggcat attgagatag catgtaggat agcataaaaa atattttgcc cttggatgta 120
aaaacgtttt ttaaacaat cagaatagtt ctactctcgt tttattacca attatagctg 180
gcacgtcagc tccttgctca atgcggacct ttcgctcgat agcttggtccg ctccgcgcca 240
gaagcgaaca gtgttatgag tggccagtga taaaacgtca gcccgttgac cttgccttac 300
agcacctcaa ccacttcaaa ttcttctgcg atcaactcca tatcttcaga aaaatgacct 360
tcagagctga aaaatctctg atgctctttc ttccagtatt caaggc 406

<210> 438
<211> 401
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 438
attgacggga tatctgacca gtcggggaat taaaaaacag gaaatcggtg aggtcaacaa 60
tgctgcggat ctgcagaaac actgtacgtc gtgttgcccg gcggtggtgt ttctgaatga 120
agactgtttc gtgcatgatg atgaaagtaa tggcattatt cgccagatca ttacgcaaaa 180
cccggcgacg ctgtttgtta tctttatgtc gctggcgaac atccattttg accgctattt 240
gcgggtacgg aagaatctgc taatcagttc aaaatcgata accccaaaag accttgatgt 300

tattctggtt aattatctta aatacaaaaa caccagtgtg gggcagttaa ctttaccgac 360
attgtcactg agtaaaacag aatcaaatat gctgcaaattg t 401

<210> 439
<211> 450
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 439
cagcagcaag gtgtttaatg aggcggtggg ccgtcaggtg gaattcgtcc aggacaacca 60
ttcccagttc cagaaacgcg tattacgcgg gttgcactat cagctggatc cgcacgctca 120
gggcaagctg gtccgctgtg tggaagggtga ggtgtttgac gtggcagtggt atatccgtcg 180
ttcatcgccct acctttggta aatgggttgg agcgggtgctc agcgcagaga ataaacgtca 240
gctgtggatc ccggaagggt tcgcccacgg gtttatggcg ctgagcgcaca cgggtgcagtt 300
tgtctataag ggcacgaact actacgcgcc gcagtcagaa cggagtatca tttggaacga 360
tccggagata aggattgact ggccggcact gagcgactgc gtgctgtctc tgcggagaa 420
agacctgcgg gcacatactc tggccactgc 450

<210> 440
<211> 380
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 440
ggggagaaaag agaccctcac catcattgac gaccttcttt gggcgccac cggcgctgag 60
ctgctggcag actgcacggc gacggcaatc cgtgaaacgc tgcgtaatcc ggcgctggcc 120
ggcacgtatc acctggtggc cagcggcgaa acagctggtg cgactatgcc cgctatgtgt 180
ttgaagtggc gagagcgcac ggtgccgagc ctggcggtgc aggaagtga ggcattccg 240
aacgacggcc tatccgacgc cggcgaagcg tccgctcaac tcgcgcctgt cgaattaaaa 300
atccagcagg cattcgggggt gactctcccg gactggcgtc aggggtgtggc tcgcgtggta 360
acagaagtcc tgggcaaata 380

<210> 441
<211> 180
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 441

agtaaattca ggctggctct ggtgcggcag aagtaccgcc cggacggcgg cgcagaacgg 60
tttgtctccc gcgcgctgga agccctcgac agcagtcatt tgcaactgaa cgtcatcacc 120
cgcgaatggc agggggccggt gaaaccggac tggcagatcc atatctgtaa cccacgtaaa 180

<210> 442
<211> 689
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 442
tcatttgaag aacgacacag aggttcgggt gaagatatca agaaccgcct gagtttttat 60
ttacctttct tgtctcgtct gaaggatctt tatcccgaag gcgtgattgc ggatattggc 120
tgtggacgtg gtgaatggct ggaaatcctg actgaaaatg gtattgcgaa catcggcgtc 180
gatctcgatg atggcatgct ggcacgtgcc aaggaagccg ggctgaacgt gcagaaaatg 240
gattgtctgc agtttctgca aaatcaagca gaccagagtc tgatagcgtt gactggtttc 300
catattgctg agcatttgcc ctttgaggta ttgcagcagc tcgtcatgca taccttacgg 360
gtgctgaaac ctggcgggtt gctaatectc gaaacgccga acccgagaa tgtaagcgtc 420
gggacctgtt cattttatat ggatccaacg cataatcacc ctttgccgcc gccattgctt 480
gagtttttac ctattcatta tggttttaac cgggcaatta ccgttcgtct acaggaaaaa 540
gaggctctca aatccccgga cgcagcgggt aatctggctg atgtgcttaa aggtgttagc 600
cccgattaca gcatcattgc tcagaaagca gcgcctgcag atgttcttga acgctttgaa 660
accctgttta cccaacaata tggcctgac 689

<210> 443
<211> 581
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 443
tgcctctatt atccaacctc tgcattgctg taaagcaaac tcttataatg atattggctg 60
tgcaggtgat gatactggag ataatatctc gtttaaaaat ccattctact gtgagctgac 120
ggcccattac tgggtatgga aaaatgaatc tctttccgat tatgtcggct tcatgcatta 180
tcgtcgacat ttaaatttct ccacgcagca ggatcatgcg gaagataact ggggggtggt 240
gaattatccg ctaataaacc cggactacga ggcacagttt ggattaaccg atgacgctat 300
tcgtacatgc gttgagggga gtgatctttt actacctaaa aaatggctcg taacatcggc 360

tggcagtaaa aataatctcg accactacag caaggggtgag tttttacata ttaaagacta 420
caaggctgcg ctagagggtg ttgaagaact ttatccagaa tataagacag caatacagca 480
gtttaataat gccactgatg gttattatac aaacatgttt gttatgcgca aagatatgtt 540
cattgattac tcagagtggg tgttttagcat tctggatcgt c 581

<210> 444
<211> 649
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 444
ggtttaaggc aggtagtcag catatttgtg atgcgattga tacggactgg gttttctttt 60
acgatgatga tgcttttcct gccagcgata tactggaaaa gttttttgct cttgaaaaaa 120
aggaatgtca ggtctttact ggttttagtca aagatcttca cggccaccct tgtgcaatga 180
atcttccttt caggaaagta ccttcacatt ttgctgatac ttacggttat attcgcaccc 240
cccaacgctt tgttcctacc attgacgaga gtgtcatggg tgagacagtt tcgtttggtg 300
gcatgattat tagcagcaaa gtattgcaag agcatattga tcacatccat gatgaactgt 360
ttatctattt tgatgatctt tattttggct atgcgttgac attggacggg caaaaaatcc 420
tctattcacc agaactgatt tttcatcatg atgtcagtat ccaggggaaa atcatctctc 480
cggaatggaa ggtatattat ctgtgccgaa atttaatttt ggccaggaaa ctattccagg 540
aagtaaaagt atttagcaat ttctctatcc ttatacgctt atgtaaatat ttatccatat 600
tgccatggca gcgcagaaaa tcatcatatc tgtgtttcat gtatcgtgg 649

<210> 445
<211> 606
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 445
gtggcattgg tcgttatagt attgctatcg ccagagcgat tattagaaat aacaatcgac 60
atgagggttt catcgcgcta tccgctatgc tgggtgagtc gattactgat gttaaggcgc 120
aatttgctga tctccagcca gcagacaaca tagtcgtctg gcatgctgca ggaccagtac 180
gtgcaatgga taaaggtaat gaatggcgtc gggagagcgc agaactgatt cgggaagcgt 240
ttcttgaatc attgcgtccg gatgtcgttt tcattacaag cttgtttgaa ggtcatgtcg 300
acgatgcggc cacttcggta cacaaattta gtcgtcagta caaagtagcc gtactgcac 360

acgatcttat tcccctgggtg caggctgaga cctatctgct ggatgatgta ttcaaatect 420
attatttaca gaaagtggaa tggttaaaaa acgctgacct tctgctaact aactccgctt 480
atacggcaca ggaagcgatt gagcatctgc atttgcaggg cgaccatgtg cagaatattg 540
cagctgcagc cgatcctcag ttttgtatgg cggaagtgac agcgagcgag aaagagtccg 600
tccttg 606

<210> 446
<211> 450
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 446
tgacctatca ctcggatatt gtgaaacaaa aacggttaat gaagttgtac cagccgctgc 60
aggagcgatt cctcgccagc gtagactgca tcgtcgctc gtcgccaac tacgtggcct 120
ccagccagac cctgaaaaaa tatcaggata aaaccgtggt gatcccgttt ggtctggagc 180
agcatgacgt gcagcacgat ccgcagcggg tggcgcaactg gcgggaaacc gtcggcgata 240
acttcttctt cttcgtcggc gctttccgct actacaaagg gctgcacatt ctgctggatg 300
ccgccgaacg taaccggctg ccggtggtga tcgtcggggg cgggccgctg gatgcggaag 360
tgcggcgtga ggcgccacag cgcgggctga gcaatgtggt gtttaccggc atgctcaact 420
acgaagataa atacattctc ttccagctct 450

<210> 447
<211> 507
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 447
ttcaggcgaa atgctatgct cgcacgcgg acttcaaaaa gcaggggacc acgctgctgc 60
tggtttccca cagcgccggg gatatcgtca agcactgcga ccgcgccatt ttctcaaaa 120
atggtgacat ctgcatggac ggcaccgccc gcgacgtaac caaccgttac ctggatgagc 180
tggttgcaa accggataaa gacagcgcga caaaaagcgc aacggctatc tcgtcagcca 240
gtggcgaaag ccagatgtct ctgatgaga ttgaagatgt gtaccacacg cgcccaggct 300
accgtccgga agaataatgc tgggggcagg gtggcgcgaa aatcatcgat tatcatatcc 360
agagcgccgg ggttgatttt cctccctcac tgacgggcaa tcagcagacc gattttctga 420
tgaaggctgt gtttgaatac gattttgatt gcgtgggtgcc tggcatcctg attaagaccc 480

tcgatggctt attcctctac ggaacca

507

<210> 448

<211> 678

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 448

gctatgaact gatcctggtg aacgatgggt cgacagacaa cagcctggcg gtgatcgccg	60
aatggcagga gcggctgcag aacgtccagg tgctggagca ggaaaaccag ggcgtctcgg	120
tcgcgcgcaa taccggcctc gccgccgcca gcggcaaata tctcgcgttt ccggatatcg	180
acgacaaact ctatccgggc atgtatcgca cgctgctgga gatggccgag aaagaacatc	240
tcgatatcgc cacctgcaac ggcacctatg tgtacgaaaa gcgccgcgag agccaccgga	300
tcttcccact ggatcgccctg cctcgcacgg gtgtgctgcc gggccatgtc tggcttaagc	360
aggccctgga ctgcgcgaag tttctgcacg tcacctggct taatatattat cgtcacgact	420
ttatccgcca gcatcacttc catttcgagc ctggcctgcg ccatcaggat atcccatgga	480
ccacagaagc cctgctggcc gcggagcgcg tgcagtacac cagtcagcag ttctatgatt	540
actacattca ctctgagtcg gtgtcgcata agccggacaa cgacgacacg ctgatgcgtt	600
cggcgcgcca ctatatgaag attctggaga tgctggaggc gattaaccag cgctaccg	660
ataaagtacg ccatatcg	678

<210> 449

<211> 585

<212> DNA

<213> *Klebsiella oxytoca*

<400> 449

ctctgcctct attgctcttg ctctcacagc gcccgtagat tcatttgcag ccagcgatca	60
gcgtgggtac aaacctgaag acgtcgcttt tgatgaaagt tttttttcgt ttggtggcca	120
tgtagggact tctgttgaat atgaagataa ggtaactcgt ggtttcaata acacggataa	180
aaaggagaag acgattacca atgaggtttt caactttttt tataacaatc cacaatggaa	240
ttttatgggt ttttactctt ttaaaataga aaatagagag caaaaggagc ctggttatta	300
tgagaatgaa gatggtatta agcagctttt ttcattgaat aaaggtcacg atcttggtaa	360
cggttgggct actggtttta tttatgagct agaataatac agaagtaaag tttattctcc	420
ggatgttagt ggtctacgta aaaaccttgc cgagcacagc attagaccat atttaaccta	480

ctggaataat gattataata tgggattcta ttctaattctt gaataccttt tgagtaaaga 540
agatcgcaat gcatggggga aaaggcaaga gcagggatat agtgc 585

<210> 450
<211> 340
<212> DNA
<213> Klebsiella oxytoca

<400> 450
tatcgatgcg gatgaaaatt gcccaactac atcgttctct gaaagaggag gggcatcctg 60
ctacaatgat ttatgttact cacgatcaga ctgaagcgtt aactctagga gatcgcatctt 120
gtgttcttaa ccatgggaat atcatgcagg ttgatacacc tactgatctt tataattatc 180
ctaataataa gttcgttgcc agttttatcg gttcaccatc aattaatttg atagatactg 240
ctatccgtaa gaataatgag aggttgtatg ttgaaattgc tcctggcgtt gaaatattaa 300
ttccacatag taagcaagtg ttgcttgaag gttatatata 340

<210> 451
<211> 608
<212> DNA
<213> Klebsiella oxytoca

<400> 451
atccaatgac cagaaatgag ctgcgtagcg ccataataa gaaaagatgc cggaaatata 60
cgcattgctt ttccctcaga caataacata gttactcctg aaatttgatt tgctcatcaa 120
tgatattacg agcacggtca agtgctgctt ttggcgcttg gtcattgatc cacatatcgg 180
taatcgcatc tgccagtggg gaccataaat aaccatttc cggaatagat ggcattggcat 240
cagagtgaag cccttgctta ataattgcgc tcgtcgcttc atttgcagtt ggtaggattt 300
tgttcatcag attcggtacc ggaggtatag attctgtcat ctcatagcgt ttcattaaca 360
tttcatcaga tgagagatag tcagcgaaaa gttgtgccgc cttaggcgat ttactataag 420
aagagacgac cgccaggcga accgtagaaa acgaacgtgg ctgttttcct tcaagagtag 480
gtatgggaac aacgcaaaa ttaattttac tggtgttata tcctggatt gccatggac 540
cgtcgatgat ggcagctact ttgccttcag aaaataagcc tcgacgcacc tgtggattac 600
gcatatct 608

<210> 452
<211> 589
<212> DNA

<213> Klebsiella oxytoca

<400> 452

cgtaaataatg ggacaaaggt ataaaccggt aacgccaaaga tcttgcaaataaat aatcaagttt	60
gttaataatg ccctgcaaata caccgcccata aaagtttttt gaatctggag gcgttcccca	120
cggttgtacg ttttctggcg atatcgatgg atcgccattg caaaatcggt caggaaagat	180
ctgataccat attgtttttt taaccatttc tggcgtagaa agtacatcac ctggattgat	240
ataaggggaag caaaaaaagt tggacaagtt actcagttct gtctctgcta cagggtggtt	300
acttatatca acacagcgtc gttcaccaaa taataatttt tccccgttat ttccgtataa	360
tataaaacca tagcggctac gtcgtttgca cggagtaaata gcggcaaacc agtggtcata	420
gtctctgctt tgtccctctt tttccatgtg aacttcggtg ccgccgctcc atccatgcgc	480
gtcgctgcgc ccaagggttc caccatctag gccaccttc tccattgat agggatcgcc	540
gatccacaga gagactttcg cgacctcgcc tttgactgtg cgaaatcta	589

<210> 453

<211> 528

<212> DNA

<213> Klebsiella oxytoca

<400> 453

gcaagggtag aggtgtattg cgccttttcc ttattagcca tcgccgcata ataggcaaaa	60
cgatattctt cataatttaa gcgaattatt tctggtagat aattatttgg acagtgtcgg	120
cttaatacac ttttttagact taacggaaag tctgagtgtg ttgttgctaa tccactgagc	180
actaacaatc taggttttaa aaccattatt ggatcaagta aggctctggc tagttgatcc	240
atccacattc ggtagacttt ttgcgcccata gcatcactgc catcaactcc ctgaattatt	300
tctaaggcac tcttccgctg aagagagaac tgaaaatact gtctttcgat cccggatgtc	360
gaaatgaatt gatgaacgca tcctatcccc cagcattcgc aaaccggaga tataccatca	420
atgagtggct gataattttt caatgggaga tgagcccagg aaacatttat tgcattgtca	480
aatacgctat catcgttgta tttatcgact acacaaagtt cacagcca	528

<210> 454

<211> 510

<212> DNA

<213> Klebsiella oxytoca

<400> 454

ataagccatg tgtttcttcc cgatgggaaa gcattagagc atttttcata tcaatcacta	60
---	----

gcatgaagcg atgtgatgga taaatctttt catctatttc aaatcgagag tacaattcga 120
tagattcatg tggtagcgcg agtcgggttaa atgagaacac gataatccga accccgcgct 180
caacggcatt aatgagttct tgagcaatga gttcaagatg gaagtcagtg ttcaggtaaa 240
cttcgatttg agccagttcg agcatttctc tggctttttg tagtgaatta tcaaaaccag 300
agacgttata tatgaactct ttctcttctc gtagcatcat acgtgagagt tcttttttta 360
atacattgat gttttcaatg gtttgctttt ctatgttgct gaaaataagc tcgggagatt 420
ttgcttgata ctcttttagta ttgccatcgg ccataaaaat gaagccattt ttatatagac 480
tatcaattga tgagtagacg ctagaacgtg 510

<210> 455
<211> 383
<212> DNA
<213> Klebsiella oxytoca

<400> 455
gccggtaatc ttgagctgct ggcccagggc cgtagcgtgc gcgtggatgt ggccgccggc 60
gccgaagcca tcatgaaagc ggtcgacggc tgcggcaggc tcgataacgt caccggcgaa 120
tccggcacca atatcggcgg catgctggaa cacgtgcgcc agaccatggc cgagctgacc 180
aacaagccga gcagcgaaat atttattcag gacctgctgg ccgttgatac ctcggtaccg 240
gtgagcgtta ccggcgggtct ggccggggag ttctcgctgg agcaggccgt gggcatcgcc 300
tcgatggatga aatcggatcg cctgcagatg gcaatgatcg cccgcgaaat cgagcagaag 360
ctcaatatcg acgtgcagat cgg 383

<210> 456
<211> 400
<212> DNA
<213> Klebsiella oxytoca

<400> 456
cctgctctat tccgtcagga gttttgccgc cgcgatgctc gcctattacg ttgccctggc 60
gattggcctt gaacgccctc atgggcactc atcaccgtct acatcgtgtc gcaaacctcg 120
gtgggcgctc cctgtgcaga agcctttatc gcctggccgg taccgtggcc ggcgcggggg 180
ccacggtatt gattgtgccg acgtttgtga atacgccaat tctatgtagc gtgattctgg 240
ctggctggat caccttctgc ctctatttat ccctgcttga acgcacgcc cgcgcctatg 300
cctttgtgct ggccgggttat accgcaagcc tgattggttt tcccgcgctc gccgatcccg 360

gcacgtgttt aacatcgccc tcatccgggt acaggaaatc 400

<210> 457
<211> 535
<212> DNA
<213> *Klebsiella oxytoca*

<400> 457
ggctgtctgc tatggattta ctctgcctgg cccgatggcg gcacggcggt gtcgattctc 60
ggggtttgct gcacgctgtt tggcagtttc gacacgccgg ccccgcatat tgtgaaatat 120
attatcggct ctgtctgggg cgtagtata agccttatct atagcttcgc cctgcttcct 180
ccgctcagcg atttccccgt gctgggtggcg gtgcttgccc cggctctatct gcttgccgga 240
tcgctgcagg cgcgggcccc cacgaccttt atggccatgg ggatcacctt gacgctgccg 300
gtactgtgcg agctggggcg gcgctacagc ggcgacttcg ccgacgcggc caacaccgcg 360
atcgccctgt ttttcgcgac cggttttgcg gttatcggca tgagtctgct gcaaaccgta 420
caggcggacg cggcgataaa gcgtctgctg aaactgtgcc aacgcgatat tcgccgcagc 480
gtgagcggcg tatttaaagg cgatgaaacg cactggacca atctgatgat cgacc 535

<210> 458
<211> 400
<212> DNA
<213> *Klebsiella oxytoca*

<400> 458
tggcgtttat tttctggaag cagtatgcgc agacgccctg gacgcgcgat ggccgggttc 60
gggcagatgt ggtgcagatt gcgccgatg tttccgggccc ggtgagcagc gtggcggtgc 120
gggataatca gtgggttaac cgcggcgatg tgcttttatgc catcgaccgc cgctggctga 180
agctggcggt gctcagcgcg caggccgacg tcgaagcaaa acgtcatgaa atgctgatgc 240
gccaggatgc cgcggcgcca cgcgcgctca tcaaaggggt catttccggc gaggatatcc 300
agcaaacagg cagcgcagct gctgttcgcg gcggccaatt atcagggggc gctggctgcg 360
ctggaactgg cgcagtgaag cttatcccat gcaacgctac 400

<210> 459
<211> 260
<212> DNA
<213> *Klebsiella oxytoca*

<400> 459

cgttctcccc tgattcttgc cggcaccocg ggaacttaca gctatgcagg aaccggtaac 60
gtagtagcga tcgctcgca tctggctaag atctgggac ttccttttagc agtccacctc 120
gatcaccatg aagatctggc cgatatcacg cgcaaagtac aggccggat ccgctcggtc 180
atgatcgacg gatcgcatc gccttttgaa gaaaacgtcg cgtagtcaa gagtgtgggt 240
gaactgagcc accgctatga 260

<210> 460
<211> 456
<212> DNA
<213> Klebsiella oxytoca

<400> 460
cggcgcatctt aaaatatcaa tcggttgatt taaatgaagt gatcacgcat tcgcttcaac 60
tggttagcca ggatgccgcc agccgggcaa tatctctgac gtttaccgcg cagcccgcgc 120
tatgccgcat ccaggccgat ccggatcggt tgaaacaggt gctgcttaac ctttatctca 180
atgctgtcca tgccattggc cgcgagggcg tgattacggt ggcggtgagg gagtgcggcg 240
atgggcgagt caaggtgagc gttgctgaca gcggcaaggg aatgacggcg gaacagctac 300
aggccatttt cacaccgtac tttagtagca aggccgacgg caccgggctg ggccctggcg 360
tggtgcagaa catcggtgag cagcacggcg ggacaattga cgccgagagc gccccggca 420
agggcgcgct atttacgttc tatttgccgg ttaatg 456

<210> 461
<211> 536
<212> DNA
<213> Klebsiella oxytoca

<400> 461
tattgaaggc accaccagcg acattcgctt cgtccacaac gttctgttcc cgtacgcccg 60
cgaacgcctg gccggtttcg ttaccgctca gcagtttgct gagccggtga agaccattct 120
cgataacctg cgcgaagaga tcgcccagcc ggcggttggc gccgaagaac ttattgctac 180
cctcttcgcc tttatggatg aagaccgcaa atcgaccgcc ctcaaggcgc tgcaggcat 240
tatctggcgc gatggctacg ttcattggca ctttaccggc cactgtatc cggatgttct 300
gccggcgctg gaaaaatgga agtcacaggg tattgattta tatgtatatt cctcaggctc 360
cgttgctgcg cagaaattgt tatttggtca cagcgatgaa ggtgatatta ctcatctgtt 420
caacggctat ttcgataccc tggtaggtgc caagcgtgaa gcgcagtcct accgcaacat 480

tgctgagcaa ctgggacagc ctctgcccgc catcctgttc ctgtccgata ttcata 536

<210> 462
<211> 557
<212> DNA
<213> Klebsiella oxytoca

<400> 462
cctggagtgt gcataagggc tggcatcgcg acggtaaact gcggatggtg ccggtcgcgc 60
cgcaacctac ccgggcgacc accgatgcgt tctatccgct gatcctcaac agcgggcgga 120
tccgcgatca atggcacacc atgacccgca ccggcgcggt gccgcgtctg atgcagcata 180
ttaacgagcc ggtggtggag gtcgcgccgg cggacgcgca gcgttatcac ctgctggaag 240
gtgaactggc gcgggtccgc tcaccgaagg gggatgatgt cgcaaaagtg acgatcggcg 300
acgggcaacg gcccggtcgc ctgtttgtgc cgatgcactg gaataatcag tttgctcgtc 360
agggacgggt gaacaacctg ctggctgcgg tcaccgaccc gcactccggg cagccggaaa 420
gtaaacagac ggcggtggcg atagccacct ggcttccctg gtggaaaggc gagctttttt 480
cgcgccagcc ggttccgctg cccgcttcgc tgcactggcg gcggcgggcg gcgcagggca 540
ttatccatct ttcgctg 557

<210> 463
<211> 231
<212> DNA
<213> Klebsiella oxytoca

<400> 463
acacgcatat aaaccgcaac cgccggccag cgccgataaa gcgcccggcg aaattattac 60
cctgccgcgc ctgcaggtgc gcaaaaccac gcctccgctc agccgctggc tgcgcgatgt 120
taccacaagt cttctgccgc cgctgctcgg gctgggattg ctgctgctgg gctggcagct 180
ggcggcgatg aacagcaaag gtttcccgac gccgctctcc acgctggatt c 231

<210> 464
<211> 459
<212> DNA
<213> Klebsiella oxytoca

<400> 464
gcgataagtt ttcgatttca cggcgacgtt tattacagac gggggcggcg ctgggcggcg 60
cgatgctgct ccccggcata atgcaggcgg cgtgggcggc tgggtcggat aaaccggaac 120
agaccaccgt gcgggtgggg tttattccgc taaccgactg cgctccctta gccattgcct 180

cctgaaggg gttcgataaa aagtacggta tcaccctcgt gccgagcaaa gaggccagct 240
gggccgcggt gcgcgacaag ctggttgccg gagagctcga cgccgcgcac attttgtacg 300
gcatgctcta cggcctggag ctggggatcg ccagtaaacc gcaggcgatg gccaacctga 360
tgacccttaa ccgcaacggc caggcgatta cgctctccag cgagctgcag gaacagggcg 420
tcaccgacct gagcgggctg aaaaaacgga tcggtcagc 459

<210> 465
<211> 594
<212> DNA
<213> *Klebsiella oxytoca*

<400> 465
atgtcatggt tccgatactg tctgccgatg aaaacagcct ggtgctggtc tgggaaaaac 60
cggagtctga gaccgagcag gtggtggact acgccgtcta tcgtcaaggc gagcggctgg 120
gcctggcgcg tgaaaatcaa aaccattttt ccccggaaca gccctatatt gataacttct 180
atcagcggat cgccagcgac ggctggcagc agaaaatcga tctgcgcagc ttcacggcca 240
ccaacctgca gccggatacg gagtatgcct ttacgggtgcg cgcggtctac gccaatggcc 300
aggaatctcc ggacagcgcg gtggttaaag cgcaaaccgc caaaacgccc cacgtcatcg 360
aagccagcac attcggcgcg aagggtgacg gcaccacgct gaataccag gcgctgcagc 420
gggccattga tagctgtacc gtcacgcact atcctcaggg ctgcaagggtg ctgatttccg 480
gcggcgaatt caaaactggc gcgttggtcc tgcacagcga tatgacctg gatattgcgg 540
ctggcgccac cctgctgggt tcggacgacg cggccagta tccgcttgat aaag 594

<210> 466
<211> 625
<212> DNA
<213> *Klebsiella oxytoca*

<400> 466
aagctggaac gtactaacga cggatttatt acctcatggg cggcaacggg cagtaatgaa 60
tgggtaagcc agcgggttcc tcacgccgat ctgattgctc agcaggataa agaacattac 120
tacgtcgggt tcttcgcctc acgtaacgcc aaaatcaccg tcagcaatgc ttccctgacg 180
acctccgcgg caaatacggc tccctccgcc ccgtatgttg ccaaaagctg gccgccggtc 240
atgcaaattg cctcggggac aaaaagccag agcaaagagt atctcctgca ggcgcgcacg 300
aatagtgcg gacgcatcac cgtgcgtcag gatgaagtgg tgatcgggca ggataaagcc 360

gtgaaggccg gagagatgta taccagcct gccgttctga aagataaaag cacattcgaa 420
attagcttca ctccagccac cggcgcaaac acgctgaccc aaacgctgac ggttgaacag 480
agcgccaatg tgacaggcaa tacgctgtac gccgcgccgg atgggctgtc gcaggctaaa 540
gggacgacgg actcgccgct ggatttagcc accgctgtcg acctcgttcc ccctggcggg 600
caaattgtat tagccgcagt gatta 625

<210> 467
<211> 503
<212> DNA
<213> *Klebsiella oxytoca*

<400> 467
acaggatagc gaacacctcg atattctacg ccagcttacc catgccatga gcgacgagcg 60
cgtacctgaa gcgtatcagc gcacccccag agctccgcag gcggtgctgg agattctggc 120
cgggatatct ctctgccga gggggaagat atggaccgcc tccggtgata cgatgaagag 180
gcgacgttta ccctacgcga atccccacgg actgcacgcg cggccaagcg cggtcctggt 240
gaaagcggtg aagcagtggc gatcgcaa atcggtggaa aatctcgaca cccgttccgc 300
tattgttgac gccaaaaatc tgatgcgggt cgtttctctc ggcgcaaagc aggggcatcg 360
gctgcatttt atggccagcg ggaagatgc ccatcaggcg ctggaggcta tcggtacggc 420
ctttaatgcc ggattaggcg aaattgccgc acagccgcag caggtcgttc agccagcaga 480
aaagcctaaa cggagctggc ttt 503

<210> 468
<211> 534
<212> DNA
<213> *Klebsiella oxytoca*

<400> 468
atccataccc tgacactcaa tacggcaatc gatatgaata tgttttgca tccgctgaag 60
ccgtcggcag tgaaccgaac ccgacacacg gaatattgcc caaatggtaa aggagtgaac 120
gtatcgctga tattaatatca ttatcagcag cccactcaca ttataggtat ttctggtggt 180
ttcactggcc gttatattgt ggaagagtta cgtcagaaaa aaattaaagt gacgccggca 240
tggttctctg agccaccag aattaatatt ttattaatg acggcgctga ggaatataag 300
ctcgtaatc ctggagcaaa aattgatgat gagtgtaaac agcaggttat tcatcatctg 360
caatgcgtcg cctctggtga ttatttagcg atcagcggca gcctgcccc ggggattgaa 420

agccgatttt atgctgaaat tattgaatta tgccagcaga aaaggtgtga agttatcctc 480
gatatcagcc atccggctct gcgccagctg cttgaattac ggcctttgtt gatc 534

<210> 469
<211> 599
<212> DNA
<213> *Klebsiella oxytoca*

<400> 469
gcttcagggtg ttgaaaatgc gattacgccc gcggatttaa aagatattta tggcggttatt 60
attgccgctg ataaagacgt taacgccgag cgatttaatg gtctgccggt cattgaagtt 120
ccggttaaag aagccattca ccatccggcc gacttaatta ataaatttat cagcggccag 180
gcggcgcgctc gtcagggtat ttctgcctcc gccgattcaa cggagaaatc cgagcgggag 240
tttttcgggc ccaaggtata taagcacctg atgagcggcg tctctaacat gctgccgttt 300
gttgctgccg gagggatttt gattgccatc tccttcctgt ggggcatcta ctccgccgat 360
ccaaactcgc cgcaatataa cgttatcgcc gccacgctaa tgaagggtggg gtcaacaggg 420
ctttctcaat tcatgggtgcg gattttcacg gcttatatgg cctgggtctaa ttccgggcgt 480
cccggtaatg gtgcgcgggc ttgtcgggtg ggctataagc caaacgcaac cgcgcgacag 540
gcttttctcg gcgggattat cgccgggtct cgccgccggg gttattttat gctgctgct 599

<210> 470
<211> 675
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 470
caagcacaac aagaaatacg tcgtcgccct ggaccagggc accaccagct cccgcgccat 60
cgtcttcgac cgcgatgcca acgtggtcag ccaggcccag cgcgagttcg ccagttcta 120
tccgcaggcc ggctgggtcg agcacgaccc gatggaaatc tgggccacgc agagttcgac 180
cctggtcgag gccctcgccc aggccagcat cgagcgcgac caggtggccg ccatcggtat 240
caccaaccag cgcgagacca cggtggtctg ggaccgtcac agcggtcggc cgatccacaa 300
cgtcatcgtc tggcagcgcc ggcgcagcgc ggcgatctgc gcgcagctca agcgcgacgg 360
gctggaagac tacatccgcg aaaccaccgg gctggtcacc gatccgtact tctccgggac 420
caagctgaag tggatcctcg acaacgtcga aggcgcccgc gaacgcgcgc gcaacggcga 480
cctgttggtc ggcaccatcg acacctggct gatctggaag ctcaccgaag gcaaggcca 540

cgtcacgcgac tacaccaatg cctcgcggac catgctgttc aatatccaca gccgcgactg 600
ggacgcacgg atgctcgagg tgctcgacat tccccgctcg atgctacccg aggtgcgcaa 660
ctcttcggag gtcta 675

<210> 471
<211> 630
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 471
gagcgacctt ggattctcga agatcctgtt cggcctgttg cctaaggaca gccaggacta 60
cgagaacgcc ttcacgctcg gcaactaccc ggccgcctgg cgcgagcatt acgaccgggc 120
tggctacgcg cgggtcgacc cgacggtcag tcaactgtacc cagagcgtac tgccgatttt 180
ctgggaaccg tccatctacc agacgcgaaa gcagcacgag ttcttcgagg aagcctcggc 240
cgccggcctg gtgtatgggc tgaccatgcc gctgcatggt gctcgcggcg aactcggcgc 300
gctgagcctc agcgtggaag cggaaaaccg ggccgaggcc aaccgtttca tggagtcggt 360
cctgccgacc ctgtggatgc tcaaggacta cgcactgcag agcggtgccg gactggcctt 420
cgaacatccg gtcagcaaac cgggtggttct gaccagcccg gagaaggaag tgttgcagtg 480
gtgcgccatc ggcaagacca gttgggagat atcggttatc tgcaactgct cggaagccaa 540
tgtgaacttc catatgggaa atattcggcg gaagttcggt gtgacctccc gccgcgtagc 600
ggccattatg gccgttaatt tgggtcttat 630

<210> 472
<211> 324
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 472
atggatgctc gggtagtgcc gcgcgctttc atcgatgaag gtacgcaggc gcttcttctg 60
ccccagcggg ctgatccgc ccaccaggta gccggtggcc cgctgcgccg cctgcggatc 120
ggccatgtcg gccttcttcg cccccgccg atgggccagg gccttcaggt cgagactgcc 180
gatcacggc accaccgcca ccagcaactc gcccttctcc gtggcggcga gcagcgtctt 240
gaacaccgc tgcggtcca ggccgagctt ttccgcggcc tccaggccat aggaaggtgc 300
cttggggtcg tggctgtagc tgag 324

<210> 473
<211> 669
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 473
gatcgtctct gccagtcga tcacctgcc caagggcggc gacgtgcacc tgggtgccgcc 60
tccgcccgaag ccttgcgtag ccatcgtggg gcatggcgtc aacgatctcg cgggttgcta 120
cgaacggatc gagcgagggc tctgccaggg gctcaatgaa cgcttggaaca tgccgccgac 180
cttgcccggc gggcaggcca atcccggcta cctgacgccg gcgggctaca gcctgccggc 240
ggacgacgaa ggcaaggcag agaaccgccg cgtcgtctac taccggcgca agttcgccag 300
tggcgccggc ggggcgcgcg tacgcagcgt agtcgtacct ttctactggg gcttccgcga 360
ggaagagcaa tacatcaaca agaccgcggc ccacggcgaa tggctggacc gcaacggcaa 420
ccggctggac aagtccggca ccaaggaagg cgggcagttc gtcaatgcca ccaccaacct 480
gccggacatg tggggccagg gtttcaacgg caagctgttc ggtttcatct cgctggactg 540
gttcggcggc accatgaccc atccgctgtt ttcggcgga gggcgcaagt acatggtcct 600
tgcggccatg cgcttgcca tgttgatcaa gatcatccgc aagcgttacc cggacgacac 660
catcaatgt 669

<210> 474
<211> 810
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 474
aggagagaac atgagtcgct caccatccc tcgccaccga gcgttgctgg ccggtttctg 60
cctggctggc gcgctgtccg ccaggctgc caccaggaa gaaatcctcg atgcggcact 120
ggtcagcggg gattcctcgc aactgaccga cagccacctg gtcgccctgc gcctgcagca 180
gcaggtcgag cgcacccgcc agaccgcac ccagttgtc gacggtctct accagaacct 240
cagccaagcc tatgatcctg gcgcccag catgtgggtc ctgccggcca acccgacaa 300
tacctgccc ttctcatcg gcgacaagg gcgcgtgtc gccagcctga gcctggaggc 360
cggcgccgc gggctggcct atggcaccaa cgtgtcacc cagttgagcg ggaccaatgc 420
cgccacgcg ccgttgctga agcgggcggg gcagtggctg gtgaacggcg acccgggcg 480
ggccactgcg aaggacttca aggtcagcgt ggtcggggtg gacaagaccg ccgccctcaa 540
cggcctgaag agcgccggcc tgcaaccggc ggacgccgcc tgcaacgcgc tgaccgacgc 600

cagttgcgcc agcaccagca aattgctggt actgggcaac ggcgccagcg ccgctagcct 660
gagcgccacg gtgcgcgcac ggctacaggc cgggctgccg atcctcttcg tgcacaccaa 720
tggctggaac cagagcagca ccggccagca gatcctcgcc ggcttgggccc tgcaggaagg 780
cccctacggc ggtaactact gggacaagga 810

<210> 475
<211> 524
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 475
aggagcaact gaagcgactc ggcacgcagg ccagggccgc ggcgatgcc tacgctcgac 60
tgggcgagat gcagcgtggc ctggatatgc aggtccgcgg cctgcaacgg ctggagcagg 120
ccagccaggc aatgccattg gctagcgcac ttcccgact ggtcgtggaa gccagcaaga 180
cggctgccgg ttatcaagcg cggttgcgcg acctgtcgat ccgcaacggc ctggacgtcg 240
gccgggagcc agccttggca tcctgatcc aggacagcgc caaccagagc ggcttgggac 300
gcacggtgac gctggacatg ctggagcact tgaacgccac cggcatgggg ttccgcccgcg 360
cgcaaatgaa tctgggactg gcgggcccgt tcggcttttg ccaagggatt gcttcagccg 420
aggttgcggg gctgggttcga gcgttgcaac tggcccaggg ttccgactcg ccagagcaat 480
tgtccgccac cctcgaccgc ctggtcgtcc tgggtaaagg caga 524

<210> 476
<211> 704
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 476
aaggttggca ggatcaacga tcagaaaatg cgcgccatgg aggcgcgcgc ggaaaaggct 60
ggcaaggcta tcggcaaaaag cctggacagt tcggcactga ttgccagcag cgtgctggac 120
caggcgctgg acatgctggg caggaccagt cgcaggcgg gtcaggccaa gaagcctgtg 180
cagagcggcc aggacaaggt actggccgag tgggaagacc ggcagaagga gctgggcgaa 240
gcctggaaga gctatcgca accactccag gatctgtcca agctcaacga agcactactg 300
aagaactctt ccgacaagct cgacaaggcg ctgctcaatc tcagcgagac cggcaagctg 360
tcgcttgcca acgtgggcaa ggccgcctac gccgatgctg cgcgcctcgc ctccgcccag 420
atgaccctga tgctgctgga cgggctgttt ggctgggtcg ccagcgctcg taccgagaag 480

cccaaggctcg acgacaaggc gggcaaggga caggcgaagg ctggcgacga cgagaaggaa 540
cagccgtcgc tccagtcgca ggtcttcaag cagtggctgt tgcagatgaa cagtgtctgg 600
ggcgcctacc gcgcgcccct gcaggatata tccgggatga ccgacgagct gttcaggaat 660
gcgtcggaga agctcgagaa gtcgctgttc aatttcgcca ctag 704

<210> 477
<211> 234
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 477
aggcatccat cgagctaccg gcaggcccgc cgcagaccct gctggtgccg ttgcggggcg 60
tttcgccaga ggctctgggc atgcgtgcgg ggccgccgat gccacagatg gtcgaaggcc 120
agcgggtgct gctggcgcca cgcgtggagg gctcgttga ccgcgccagg gtcggagcgc 180
tgagcctgtc cctgcgctcg ccgcaagctc cccagagtat cctgctcgga cgtt 234

<210> 478
<211> 349
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 478
gcgaggaggt attcgacagc ctccctggaga tgcgcgtggc gatcctgctg aacctggggc 60
gcgcggaaca ggcgctggcc ctgatcggcg agatggagga gaaggctcag ggcgcgagat 120
ggaacaacat cagccagcca cggcgtctgt acaaggccca cggcctggcg ttgctggggc 180
gcgacgagga ggccctggag gcgctgctgc cgttctccga gattgccccg cgctaccgta 240
cgatctggct gcgcgcccgc tacctgctgc tgcaacggac ccctgagcgc aacacctggg 300
acttcggcgg gcgcctgcag cagatgctcg aacactactc gcagaaggg 349

<210> 479
<211> 402
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 479
aaggacttct ggtcgggtgct cgaaccgcag gacggccagg ccgcactgat ggcgcggatg 60
ctcgagcttg gccacagcca gccgttgacg ccgaatgcga agatccccga aggcttgac 120
atttcgatca accgcgccaa ccagtgcccg acgccggcca gcacgatgc gttcatccgc 180

aagaacccag gttccggcat gccttttcgcg gtggccgggc tgagcgacga cgaatacgcc 240
actttgcaga agtggctggc cgcgggcgcc ccggtcgacc agcagccgtt gcggccgacc 300
gccgccgagg cgcgccaggt ggccagctgg gagcgtttcc tcaaccagcc tggggccaag 360
cagagcctgg tctcgcgctg gctctacgag cacctgttcc tg 402

<210> 480
<211> 514
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 480
ttccctaacg aatgctgtca atcgctgggt tcagattgct ggtagtggac ccggcgcata 60
cgttgccacc ttcgcggtgc tgtegctgta ttccgaccag gctggtaaag acagtgacaa 120
ggttcctgcc ggcgttcgca atgcattggc actggaggcg tccgctctgg ggcttcctgg 180
cacggctgat ttgcaaagcg tcgccaaggc aggtggcacg gttgatatgc cggtagact 240
cacgagtgtc gcacaagaga gcccgagtgg taaatcgag attgccgcga tgttgaccaa 300
cgggtgcaact gtccccaagg gcgtgcctgt tcgcgcgcgc accctcaatg ctgcgacggg 360
ccggtatgag gtgacggttc ccgcaaagtc caccgtgccg aatacaccac cgctgatctt 420
gacctggacc cctgccacce ctccaggaag ccagaacccc tcaagcacca ctccggtcgt 480
accgcagccg gttccggtgt atgagggagc aacg 514

<210> 481
<211> 604
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 481
cgagcaccaa tatcgaactg gtttcgacca agggcgacct ggacctcgac ggctcgggtga 60
actgggcatc gggcaaccgg ctggggctgg gctccgcggc cgacctgacg ctgaatggca 120
ggctgaatgc cagtggcgcc aaggctgggc tggagctgaa ggccgaaggc gctatcgata 180
tcaatgacaa gatcgttctc ggccggggctg gcagcgcgct ggccatggat gccggcgaag 240
gccaccgggt gaacggcacg gcgtcgggtc ccctggccgg ggccaacgcg acctacgtct 300
ccggtggcta ttactacacg gtggtgcaga acctggcgca gttgcaggcg atcaacaaga 360
acctggacgg cctgtacgtg ctccggcgca atatcctggg cggcagctat tactgcacgg 420
cgctgcaatc catcggcggg ccgcgcggcg tcttcagcgg caccctggac ggtctcggca 480

acagcatcgg caatctctcg atcagcaaca ccgggccgaa tgcggggctg ttcgcccgt 540
cctcgggcac cctgagcaac ctgaagctga acaacctgcg ggtatccgat aacacctacg 600
gctc 604

<210> 482
<211> 412
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 482
gctttacctt gatcgaactg atgatcgtgg ttgcatcat cggtattctt gctgccgtcg 60
ctttgccggc atatcaggat tacaccattc gtgctcgcgt gacagagggg gttggcctgg 120
ctgccagcgc caagacgctt attggcgata gctctgccac tgccgggtgag ctagccgctt 180
cggcaagggt ctggaatgct caagccggta acgccgggtgc taccagtaag tatgtgacct 240
ctgtacaaat tgcagaggcg actggtgaaa tcaactgttac tttcaatgcc gcaaactggg 300
gtaatatccc ggctaactct accctgggtat ttactcccta tgtgcagaat gctgccgggtg 360
ccccgactca attgggtgcc agttatgctt ccgggtgtgac tggctctatt ga 412

<210> 483
<211> 320
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 483
tgccgtgagt gaaatcagcg cgttgaagac cgctgcggag tcggcgattc tggaaggcaa 60
gaagcttggt tccaaggata atcccgcgga tggggaatat gatcttggtt ttaccaagtc 120
tactttgctt gctggcaacg acggtaaggc acagatcacc atcactggcg aaagcagtgc 180
aaccceggacc attgcgggga ctctgggtaa ctctgctggt aaggccatca gcggtgccgt 240
tatcaccatc aagcgtagtg ctgagggagt ctggacctgc gctaccagtg ggtctccggc 300
caactggaaa gccaaactacg 320

<210> 484
<211> 738
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 484
ggtatcaacc cactaaaggc ccgcaagaaa ggtatcacc tgtgggcagg gaagaagatt 60
aagcccatgg acatcgcctt gtttcaactc gcagatgtct accatgatgg gtgccggcga 120

ccggtactgc aatcttttga catcatcggc gaaggattcg aaaatccaaa catgcgcaag 180
ctagtcgatg agatcaagca ggatgttgcc gccggtaaca gcttagccag ttcacttcga 240
aagaaacca tttacttcga tgatctctac tgcaacctgg tcgatgctgg cgaacagtcc 300
ggtgctttgg agacattatt ggatcgggta gcaacttata aagaaaagac agaatccctg 360
aaagccaaaa ttaaaaaagc catgacttat ccattgcag taattgtagt ggcccttgta 420
gtatcggcga tccttctgat aaaagtggtc ccacagttcc agtccgtatt tgcaaatttt 480
ggtgccgagt tgccggcctt tactcaaatg gtcacatc tttccgagat gcttcaagag 540
tggtggctca tagtgcttat tggctttttt gccgcagctt ttgcatttag ggaagctcat 600
catttgggat cagtagatcg gggcctgctg aaactaccta tcatcggcgg gatactttac 660
aaatcagcta tcgcccgcta cggccgaacg ctatccacta cctttgcggc tggagtgcct 720
ctggtagaag ctctggac 738

<210> 485
<211> 740
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 485
gaagtgaact ccgccaagga tctgaaggcg gcgctgggca tcatcgtgca gcgggtcaag 60
gaagccatgg gtaccaggt ctgctcggtg tacctgctcg acaccgagac ccagcgtttc 120
gtcctgatgg ccaccgaagg cctcaacaag cgttccatcg gcaaggtcag catggccccc 180
agcgaaggcc tggtcggcct ggtcggcacc cgcgaggagc cgctcaacct ggagaacgcc 240
gccgcccacc cgcgctaccg ctatttcgcc gagaccggcg aggagcgcta cgcgctcgttc 300
ctcggcgcg c gatcatcca ccataggcgg gtgatggggg tgctgggtgg gcagcagaag 360
gagcgccgcc agttcgacga aggcgaggag gccttcctcg tcaccatgag cggccagctc 420
gccgggggtca tcgcgcatgc cgaggcgacc ggttcgatcc gcggcctggg caagctcggc 480
aagggcattc aggaagccaa gtctcgtcggc gtgcccggcg cccccgggt cggggtgggc 540
aaggcgggtg tgggtgttgcc tccggccgac ctggaagtgg tgccggacaa gcaggtcgac 600
gacatcgacg ccgagatcg cctgttcaag caggccctgg agggcggttc cgcgacatg 660
cgcgcgctgt cgagcaagct cgccagccag ttgcgcaagg aagaacgcgc gctgttcgac 720
gtctacctga tgatgctcga 740

<210> 486
<211> 680
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 486
tcgagaagtc gatgttcaag gacctcggca ttcccactcc ggattttgcg gacgtccagt 60
cccaggccga cgttgatgcc gctgcagcag ccataggcgt gccggcggtg ctcaagaccc 120
gcacactggg gtacgacggc aagggccaga aggtcctgcg ccaaccggcc gacgtgcagg 180
gcgcgtttgc cgaactgggc agcgtgccgt gcatacctcga gggcttcgtg ccgttcaccg 240
gggaagtttc gctggtggcg gtgcgcgctc gagatgggga gacgcgttta taccctctgg 300
tgcacaacac ccacgacagc ggcatcctca agctctccgt ggccagcagc gcgcatccgt 360
tgcaggcgct ggccgaggac tacgtcggcc gtgtgctggc ccggctcgac tacgtcggcg 420
tgctggcctt cgagttcttc gaggtggacg gcggcctgaa ggccaacgag atcgccccgc 480
gcgtgcacaa ctccgggcac tggaccatcg aaggcgccga gtgcagccag ttcgagaacc 540
acctgcgcgc cgtcgccggc ctgccgctgg gctcgaccgc caaggtcggc gagagcgcga 600
tgctcaattt catcggcgcg gtgcccccg gtgctcaggt ggtcgccgct gccgactgcc 660
acctgcatca ctacggcaag 680

<210> 487
<211> 210
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 487
agacctacaa caaggtttcg cgcttcatec gcgagatccc gccggcgctg atccaggaag 60
tgcgctgtc caataccgtc agccgccctt acggcggcac ctcgcgcagt gccggcggca 120
acctcttcag cggcgccggg gtgccggaga cgcccttctc cctcggccag cgggtgcgcc 180
acgcgctggt cggcgaaggg actatcctca 210

<210> 488
<211> 351
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 488
attcctctct gaatcgctgg aagggtttc cgccgccatg atcgccgagc tgggacgcta 60
ccggcatcag gtcttcatec agaagctggg ctgggacgtg gtctccacct ccagggtccg 120

cgaccaggag ttcgaccagt tgcaccatcc gcaaaccgcg tacatcgtcg ccatgggccc 180
ccagggcatc tgcggttggt cccgcctgct gccgacgacc gacgcctacc tgctcaagga 240
agtcttcgcc tacctgtgca gcgaaacccc gccgagcgat ccgtcggctc gggagctttc 300
gcgctacgcc gccagcgcgg cggacgatcc gcaactggcg atgaagatat t 351

<210> 489
<211> 530
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 489
aggaatgacg gaggtttttt gctgtggtgg cacggtttgc gttgcgagat gcagccgac 60
cacgacagcc agggcggtgt cgcgcctctg gaaaaggaag tgcggcgcct gggcttcgat 120
tactacgcct atggcggtgc ccacacgatt cccttcaccc ggccgaagac cgagggtccat 180
ggcacctatc ccaaggcctg gctggagcga taccagatgc agaactacgg ggccgtggat 240
ccggcgatcc tcaacggcct gcgctcctcg gaaatggtgg tctggagcga cagactgttc 300
gaccagagcc ggatgctctg gaacgaggct cgcgattggg gcctctgtgt cggcgcgacc 360
ttgccgatcc gcgcgccgaa caatttgctc agcgtgcttt ccgtggcgcg cgaccagcag 420
aacatctcca gcttcgagcg cgaggaaatc cgcctgcggc tgcgttgcat gatcgagttg 480
ctgaccaga agctgaccga cctggagcat ccgatgctga tgtccaaccc 530

<210> 490
<211> 569
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 490
ttcaacctca acggactggt gcgcaagcgc aaggtcaagc cggactcggg gaagcagttc 60
cgtcgcctgc tggccaccct ggggatgaag gaagagatcg tccagggtt gccggaccgg 120
ctggccgact ggctcgacgc cgaccagaat ccgcaggcgc agcaaggcgc cgaggacaac 180
cagtacctgc tggaggcgcc ggcctaccgc gccgccaacc gcagtttcaa ggacgtgtcc 240
gagctgcgcc tgctgaaatt gtcggaagcc gactatcgac gcctgctgcc gttcgtcagc 300
gccttgcccg aagatgcgcc gctgaacgtg aacactgcc a gcgtgccggg gctggccgcc 360
atgttcgaga tcgatccggg acaggcggaa aacatcgtgg acgcccgcgg tcgggaaggt 420
ttccagagca aggacgattt caccaagcat ctgaccagc tgggttcgaa gaccggaac 480

gtcagttatg ccgtcggcac ccgtacttc caggtgatca gcgaggtcag cctgggcgac 540
cgccggcagg tgctggtgag taccttgca 569

<210> 491
<211> 345
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 491
cattgaaagg tcgtagcgat gcgtataccc aggtagacaa cttcctgcat gcctatgcgc 60
ggggcgggga cgaattggtc aatggccatc cgtcctatac cgtcgaccag gcggcggagc 120
agatcctccg cgaacaggcg tcttggcaga aagcgccggg cgactcgggtg ctgaccctgt 180
cctattcggtt cctgaccaaa ccgaacgact tcttcaatac gccgtggaag tatgtcagcg 240
atatctactc gctgggcaag ttcagcgcct tttccgcgca gcagcaggcc caggccaagt 300
tgtcgtgca atcctggtcg gacgtcacca atatccactt cgtcg 345

<210> 492
<211> 576
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 492
ggcgaagcac atcctagtgc gcgacggcca gcatgtggag gcgggcgagc cgctgatccg 60
catggaaccg acccaggccc gggccaacgt cgattcgctg ctcaaccggt acgccaacgc 120
gcggctcaac caggcgcgcc tgcaggccga atacgacggc cggcggaccc tggagatgcc 180
cgcggggctg gccgagcagg ccccgctgcc gaccctcggc gagcgccctgg agttgcagcg 240
gcagttgctg cacagccgcc agaccgcgct ggccaacgaa ctctccgcat tgcgggcgaa 300
catcgagggg ctgcgcgccc agctcgaagg gttgcgccag accgagggca accagcgcct 360
gcaacaacgc ctgttgaaca gccagttgag cgggtgcgcgc gacctcgccg aggaaggcta 420
catgccgcgc aaccagttgc tcgaacagga gcgccaactg gccgaggtga acgcccggct 480
atcgagagc agcggtcgct tcgggcagat ccgccagagc atcgccgagg cgcagatgcg 540
catcgcccaa cgcgaggagg agtaccgcaa ggaagt 576

<210> 493
<211> 581
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 493
ccgaaggact tggtttactc caactttgtg cagcaggacg gcggtagcac cctgttgggg 60
cagtacgaca tgatcaacga aggcagccaa gtgattgaac ttgccgtcaa cttgcaacaa 120
gggttagtg acaccttcac ctggagcgtc actgagcagt tgaaggtcgg tgtggaagtc 180
aaggtgaagg cgaacattcc cctagtgggc ggcgctgaga tcaccagtac ggtggaattg 240
tactgtcct ctaccaagg ggcgagtacc agcaagtctt ccaactatgg cgcctctacc 300
aaggtgctta tttccccaca tagccacggc tggggagagg ttgccttgag ctttactgag 360
ctgcgcactc agtgggtcgg taatgtcggg cttcaaggat atgtggcaat ttggttcaac 420
aacaagtcg cattgaacaa cgatggcgat taccactacc tgtggttcat tcccgtggag 480
caggtatttt gggagtgcgt ccagcacaac atagtcaata cctcgggcta tgcgtacaa 540
ggcaatggag tgttggcgca agccacaggc accttccata g 581

<210> 494
<211> 457
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 494
cactttccgt tattgcctcg aagacgaagg ctacagcgtg gccaccgcca gcagcgcgcc 60
gcaggcggag gccctgttgc agcgccaggc attcgacctg tgcttctcgc acctgcgcct 120
gggcgaagac aacgggctcg acgttctcgc ccagatgcgc gtccaggcgc catggatgcg 180
cgtggtgatc gtcaccgcgc attcggcggc ggataccgcg gtcgatgcca tgcaggccgg 240
cgcggtggat tacctggtca agccctgcag cccggaccaa ctgcgcctgg ccgccgcaa 300
gcaactggag gtgcgccaac tgaccgcgcg cctggaggcc ctggaggacg aagtgcgccg 360
ccagggcgac ggcctggaat cgcacagccc ggccatggcc gcggtactgg agaccgcgcg 420
ccaggtagcg gcgaccgacg ccaacatcct catcctc 457

<210> 495
<211> 289
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 495
gactggctga atcgtctcgc cgaggccgat cgccagaaca gtttccaagg caccttcgtc 60
tacgagcgca atggcagctt ctccacccat gagatctggc atcgcgtgga gagcgatggt 120

gcggttcgcg agcgccctgct ccagctcgac ggcgcgcgcc aggaagtggc ccgggtcgac 180
gggcgcaccc agtgcacag cggcggcctt gccgaccaac tggccgatgc ccagctgtgg 240
ccggtgcgca agttegatcc ctcccagctg gcttccctggc acgacctgc 289

<210> 496
<211> 659
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 496
attgtcgatg acgaacctct ggcgcgagag cgcctggccc gattggtagg gcaactggac 60
ggctatcgcg tcctcgagcc ctccggccagc aatggcgaag aagcgcctgac gctgatcgac 120
agcctcaagc ccgatatcgt cctgctggat atccgcatgc ccggtctgga cggcctccag 180
gtcgcggcca gactctgcga gcgggaagcg ccgcccggctg tgatcttctg cacggcccat 240
gacgaattcg ccctggaagc cttccaggtc agcgcctggg gctacctggc caagccggcg 300
cgcagcgaag acctggccga ggcgttgaag aaagcctcgc gaccgaaccg cgtgcaactg 360
gccgcgctga ccaagccccc ggcctccggc ggcagcggtc cgcgcagcca catcagtgc 420
cggacccgca aggggatcga gctgatcccg ctggaagagg tgatcttctt cattgccgac 480
cacaagtacg tgaccttgcg ccatgcgcag ggcgaggtgc tgctggacga gccgttgaag 540
gcgctggaag acgagttcgg cgagcgcttc gtgcgcatcc accgcaacgc gctggtcgcc 600
cgcgaaacgga tcgaacgcct gcagcgtagc ccgctggggc atttccagct ctacctgaa 659

<210> 497
<211> 629
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 497
cgtttgggac agattgaggc ccgccaggtc gccaccccca gtgaagcgca gcagttggcc 60
cagcgccagg acgcgcgaa gggtagggg ctgctcgctc gcctgggcgc ggcgctcgtg 120
cgtecgttcg tggcgatcat ggactggctg ggcaaactgt tgggctccca cgcccgacc 180
ggcccgagc ccagtcagga cgcgcagcct gcggatcatg cctcggccgt cgtgttcaag 240
cagatgggtg tgacagcaggc attgccccatg acctgaagg gactcgacaa ggcgagcgag 300
ctggcgaccc tgacaccgga aggactggcc cgggagcact ccgcctggc cagcggagat 360
ggggcgctgc gttcgctgag caccgccttg gccggcattc gtgccggcag ccaggtcgag 420

gagtcccgtgta tccaggctgg ccgcctgctc gaacggagca tcggcgggat cgcgctgcag 480
cagtggggca ccaccggcgg tgccgcgagt caactggtgc tcgacgcaag cccggaactg 540
cggcgcgaaa tcaccgacca gttgcatcag gtaatgagcg aggtcgcact gttgcgcaa 600
gcggtagaga gcgaggtcag cagagtatc 629

<210> 498
<211> 332
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 498
aatgcgataa ccatcagcgt cggcgaggcg gcggacagca gcgtcgatct cggcgccacc 60
atgatcacct ccaaccagtt gggcaccatc accgaggaca ggggtccta tacgccaggc 120
actatcgcca cggcgacccg cctggctctg actccgcgcg agacgccccca gtcgatcacc 180
gtggtcaccg gccagaacat ggacgacttc ggctcaaca acatcgacga cgtcatgcgc 240
catacgccgg gcatcacctg ctccggcctac gacactgacc gcaacaacta ctatgcccg 300
ggcttctcga tcaacaactt ccagtacgac gg 332

<210> 499
<211> 456
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 499
ctgggacgtt agtgtcatcg acgagatgga aatcgatggt tatgacgcac tcagtcctta 60
ttacatgttg atccaggaag atactcctga agcccaggtt ttcggttgct ggcgaattct 120
cgataccact ggcccctaca tgctgaagaa caccttcccg gagcttctgc acggcaagga 180
agcgccttgc tcgccgcaca tctgggaact cagccgtttc gccatcaact ctggacagaa 240
aggctcgtg ggcttttccg actgtacgct ggaggcgatg cgcgcgctgg cccgctacag 300
cctgcagaac gacatccaga cgctggtgac ggtaaccacc gtaggcgtgg agaagatgat 360
gatccgtgcc ggctggacg tategcgctt cggctccgcac ctgaagatcg gcatcgagcg 420
cgcggtggcc ttgcgcatcg aactcaatgc caagac 456

<210> 500
<211> 275
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 500
aagaagtctc tgctccccct cggcctggcc atcgggtctcg cctctctcgc tgccagccct 60
ctgatccagg ccagcaccta caccagacc aaatacccca tcgtgctggc ccacggcatg 120
ctcggtctcg acaacatcct cggggtcgac tactgggttcg gcattcccag cgccttgccg 180
cgtgacggtg cccaggtcta cgtcaccgaa gtcagccagt tggacacctc ggaagtccgc 240
ggcgagcagt tgctgcaaca ggtggaggaa atcgt 275

<210> 501
<211> 648
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 501
atggcagttt cagtgtcgac gccagcggca acctgctgat caccgcgcac atccgcaacc 60
tgttcgacta cttcctcagc gccgtcggcg aagagcccct gcagcaaagc ctggaccgcc 120
tgcgcgcta catcgccgcc gaactccagg agccggcgcg cggccaggcg ttggcgctga 180
tgcagcaata catcgactac aagaaggaa tggtgctgct cgaacgcgcac ctgccgcgcc 240
tggccgacct cgacgccctg cgccagcggg aagccgcggt gaaagccctg cgcgcgcgga 300
tcttcagcaa cgaagcgcac gtggcgttct tcgccgacga ggaaacctac aaccagttca 360
ccctggagcg cctggcgatc cgccaggacg gcaagctcag cgccgaggaa aaggccgccg 420
ccatcgaccg cctgcgcgcc agcctgccgg aagaccagca ggaaagcgtg ctgccgcaac 480
tgcaaagcga actgcagcag cagaccgccg ccctccaggc cgctggcgcc ggcccggaa 540
ccatccgcca gatgcgtcag caactggtgg gcgccgaagc caccaccgcg ctggagcaac 600
tcgatcggca acgctcggcc tggaagggcc ggctggacga ctatttcg 648

<210> 502
<211> 405
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 502
aatgtcggca tcattctcgc caacgaggcg gggcaggtgc tgtgggcgcg gcgtatcaat 60
caggaagcct ggcagttccc gcaggaggc atcaatgatc gcgaaacgcc ggaagaggcg 120
ctgtatcgcg aattgaacga agaagtcggg ctggaggccg gggacgtgcg catcctggcc 180
tgcaccgcg gctggctgcg ctaccgtttg ccgcagcgcc tggcgcggaac ccacagccag 240
ccgctgtgca tcggccagaa gcagaaatgg ttctgctgc ggctgatgtc cgacgaggcg 300

cgcggtgcgca tggatatcac cagcaagccc gagttcgacg gctggcgctg ggtgagttac 360
tggtagcccc tgggacaggt ggtgaccttc aagcgcgagg tctac 405

<210> 503
<211> 542
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 503
gacctgctgt tccagttgct cggctatctg gccaaagagcg gcggggcgggt ggaggagatg 60
catatccgcc aggcgcgcga ggagatggcg ttgcgcaagc tcgataggcg agcccagcgg 120
cgtgccatcg cgtccttcgg caagggcaag gccggcatcg cccatctgca ggcggaggtc 180
gcgcgtctga agggcgaacg tgcggaggca gtattgctcg cctgctggcg gatggcctgg 240
gctggcgggcg tgctcagcca gtcggcgcgga caactgggtg tgcaatgggg gcgctggctg 300
ggttggtcgg cggagcgaac ggaacgcttg tcggcgcggg tcatgccgaa gcggacgcgc 360
gctgtcgccc gggatagcta ccgtgaggcc ctgctgctgc tcggcggtgga ggccggaagc 420
gagccggcgc tgatcaaacg cgcctatcgc aagctgatca gccagcatca tccggacaaa 480
ctggcgggag ccggcgccag cgtcgagcgc gtgcgtgcgg ctaccgagaa aaccctgaa 540
tt 542

<210> 504
<211> 427
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 504
cctgctcaac accttctatc cgcagttgcc ggcggtggcg cgtttcatcg aactgggccc 60
ccagttgcac caccggcgcg gcatccgcca cctggacgcg gcctgcgggg tgcaggtcgg 120
tttcgccacc ctggacatcc tcgcgcggtt gctggagggc gtcggcccct ggtcgctgga 180
gtcgccctcg aacgacctgt cggcgatgcg cgggctgtcc ctggtgttgg cggaagtgcc 240
gttgagcctg cacgtgctca acgaactggc ggccgcccgc gatgggcgca tgaccttgtt 300
gcagcgcgtc agcctgacca ccgatcgcgg cacgctgagc ctgctcagcc cccatggccc 360
gttggtgtgg acgctgcgg tggcggtacc ggcagaggat gacgacggcc tgttcgcggt 420
gttcgac 427

<210> 505
<211> 417
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 505
gttgaaaggg ttaccgaca acctggaatt gcggcggcgc aaccgtgcca cggtcgagca 60
ctacatgcgc atgaaggggg ccgaacgggt gcagcggcac agcctgttcg tcgaggacgg 120
ctgcgccggc aactggacca cggaaagcgg cgaaccctg gttttccggg gccatgagag 180
cctcaggcgg ctgcgccgagt ggctcgagcg ctgcttcccc gactgggagt ggcacaacgt 240
gcggatcttc gagaccgagg atccgaacca cctctgggtc gagtgcgacg ggcgcggcaa 300
ggcgttggtc ccgggggtatc cgcagggtta ttgcgagaac cactacatcc attccttcga 360
actcgagaac ggccggataa aacgcaatcg cgagttcacg aaccgatgc agaaatt 417

<210> 506
<211> 356
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 506
atgctcgata atgctattcc ccaaggtttc gaagacgccg tggagttgcg caggaagaat 60
cgcgagacgg tggtaagta tatgaacacc aaaggccagg atgcctgcg ccgccatgaa 120
cttttcgtcg aggacggctg tggcggttta tggaccaccg ataccggctc gcccatcgtc 180
attcgtggca aggacaagct ggccgagcac gcggtgtggt cgctgaaatg cttcccggat 240
tgggagtggt acaacatcaa ggtcttcgag accgacgac ccaaccactt ctgggtcgag 300
tgcgacggcc acggcaagat cctcttcccc gggatatccg agggttacta cgagaa 356

<210> 507
<211> 671
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 507
gacttcgctg ttcgacttcc agggcgcagg cgatacccag gtcgcccccg acctgaccaa 60
cgtcccgcag agcgacgcgc gcaaggagga cgcctactgg cagcagttct accggcccag 120
tcccaaatac tggtcctacg agcccaagag cctgccccgc caggaaaagg gccagcgcgc 180
taccctcgcg gtgccctacc agttgcacgc cacgctggcc ctcgacatcg ccgccggcaa 240
getgcgcctg acctgggca acgacggcat gagcctgccg ggcaatccgc aggacactgc 300

cgctgcggta ttccaggtgc agccgcggga agtcggcaat ccgcgcttct ataccgtgac 360
cagctatccg gtggtccagg aaagcggaga ggaactgggc cggaccctca acgacgaact 420
cgacgacctg ctcgacgcca acggccgcta cgccttcgag gtgcacggcc ccaacggctt 480
cttccgcgag ttccacggca acctgcatct cgccgcgcag atggcgcggc ccgaggtatc 540
ggtcacctat caacgcaacg gcaacctgca gttgaacatc cgcaatctcg gccgcctgcc 600
gtgcaggcgt gacggtgacg ccgaaccgcg cctatacccg ggaggcagcc gtcgctatga 660
actcgaaccg a 671

<210> 508
<211> 304
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 508
gtgttccagg tgttcgacct gctcgacagc gagaaccgcg cgaaacgcta caccgtcggc 60
gcgcgcaagc gcctgcacga cagcttccag ggcgacgcca gcggcgacta ccacctggaa 120
gtgcacggtc cgaacggttt cctccgggtc tttcgcggca acctgcggcg cgacctggcg 180
gacggcaagg cgccgctgcc ggaagtgcgg atcgactacg agccgctggt cggcaacctg 240
cgcgtgcaac tgatcaaccg tggccgccat ccggtcaagc tgacgggtcaa ggacaacgtc 300
tattc 304

<210> 509
<211> 302
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 509
acaacctgga acagcaactc ggcgagttcg gccgcaacgc cgggcagatg tccgagatcg 60
aacgcaagca ggccgccgaa ggtctgatcg aacagctcaa gcgcgaggtg gcggtcggcg 120
ccgatccgcg ccagaccttc gaggagatcc agcgtctgac gccctatgtg gaggccgatg 180
ccaggcgccg cgaggcgctc gacttcgaga tctggatggc gctcaaggac aacgcctccg 240
tccagcagca agcgccgacg cctggcgagg aagagcaact gcgcgaatac gcgcaagagt 300
cg 302

<210> 510
<211> 722
<212> DNA

<213> Pseudomonas aeruginosa

<400> 510

gtcaaggggtg ttgtctgccg tgccctgctg ggcgctggtc gcgagggtgcc ggagtgggac	60
gatatgggttg cggaatacgc cgagcaattg ctgcaggagc accccgaagg ggttttcaac	120
ctggcgggat ggtcgctcgg cggcaacctg gcgatggatg tcgcggccccg gctggagcag	180
cgtgggcggc aggtggcttt cgtcggctgg atcgatgcac cggcaccggt cagggtcgaa	240
gcgttctgga acgagatcgg gccgacgccg gaggcagtcc cgaacctatc cgtgggcgag	300
atgcgggttg aactgctcgg tgtcatgttt ccggagcggg ccgagcatat cgaacgggcc	360
tggtcacga tctgctccgc cacgacggac gatgagcagc gctggacgag gatgagcgac	420
tgggcggaag cggagatcgg cggcgagttc gcgacactgc gcagcgaaat cgcacagagc	480
aacgaactgg aagtgtcctg ggagttgaaa cagatcctcg acgagcgcct gaaagcgatg	540
gattaccgc gtctgacggc gaaggtcagc ctctggtggg ccgcgcgcag caccaatgcc	600
atccagcggg gcgcgggtga gcgctcgatg gccgaggcga tcggggctga gcgtgtcgaa	660
ccggtgcggg tgctggatac ccggcacgac aagatcatcg accaccctga gtttgtgcag	720
ag	722

<210> 511

<211> 616

<212> DNA

<213> Pseudomonas aeruginosa

<400> 511

aagtccgttac tggagtcctt ggtggaggcg ctgaaccaga ctgcgctggg cgatgcctac	60
gagctcgtgg gcgtgatcta cgacgacgac gcggagctgc ctgcgcacca gggaaaaatc	120
aaggactacg gtttcgccta tcgtcccggg cagcaatggt tctatccggc agacctgcag	180
gtgcaaggca agaccctgaa cgacctcttg ctacgcgtgc cgtccaccta ccgtcggtag	240
ccgcggggta ccccgagca tgtggccggc aagagcgatt tcgagcgacg cctgcatgac	300
accctggttg agctgggcgc cgatgtggtg gtattggacg ggctcctggt catcctcgat	360
gagctggtac gcccgggcgc tccgttcgca cggcggatca tgaatatcca tcctggcgtg	420
acgcgcgagg actcgcctta cgagcgtcgt ggccctatg cgaccctgga cgcgttgtat	480
ggagcgcggg gcgagaaggt ggtggattgg gcgaccatgg aaaaggctcg ggtcgagccg	540
ctgtactgga ccggagcact cgttcactat gtggacaatg gcatcgattc cggcgaagtg	600

ttccatgatg tgctga

616

<210> 512
<211> 741
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 512
cttcagttcc gagatgccga gaaaaaactt gaggcgtcgg tacaagccga gctggataag 60
gctgatgccg ctcttgggtcc ggcaaagaat cttgcacccat tggacgtcat caaccgcagt 120
ctgaccatcg ttggaaacgc cctccagcaa aagaatcaaa aactactgct gaatcagaag 180
aagattacca gcctgggtgc aaagaatttc cttaccgcgtc cggcggaaga gatcggtgaa 240
caagcgggtgc gagaaggcaa tattaacggg cctgaagcct atatgcgctt cctcgacagg 300
gaaatggaag gtctcacggc agcttataac gtaaaaactct tcaccgaagc gatcagtagt 360
ctccagatcc gcatgaatac gttgaccgcc gccaaagcaa gtattgaggc ggccgcagca 420
aacaaggcgc gtgaacaagc agcggctgag gccaaacgca aagccgaaga gcaggcccgc 480
cagcaagcgg cgataagagc tgccaatacc tatgccatgc cggccaatgg cagcgttgtc 540
gccaccgccg caggccgggg tctgatccag gtgcgacaag gcgccgcac ccttgctcaa 600
gcgatctccg atgcgattgc cgtcctgggc cgggtcctgg cttcagcacc ctcggtgatg 660
gccgtgggct ttgccagtct gacctactcc tcccggactg ccgagcaatg gcaggaccaa 720
acgcccgata gcgttcgtta c 741

<210> 513
<211> 211
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 513
atatacgga aaagagtttc ttgagtttgt tgaagacata tacacaaaca ataagaaaaa 60
gttccctacc gaggagtctc atattcaagc cgtgcttgaa tttaaaaaac taacggaaca 120
cccaagcggc tcagaccttc ttactaccc caacgaaaat agagaagata gccagctgg 180
agttgtaaag gaagttaaag aatggcgtgc t 211

<210> 514
<211> 589
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 514
tatacggctt cagactttcc tcagaagtca gagtcgatgt accagagtca gttgctggcc 60
agccgaaaat tctatggaga gttcctggat cgccatatga gtgagctggc caaagcgtac 120
agcgccgata tctataaggc gcaaatcgct atcttgaaac aaacgtctca agagctggag 180
aataaagccc ggtcattgga agcagaagcc cagcgagccg ctgctgaggt ggaggcggac 240
tacaaggcca ggaaggcaaa tgtcgagaaa aaagtgcagt ccgagcttga ccaggctggg 300
aatgctttgc ctcaactgac caatccaacg ccagagcagt ggcttgaacg cgctactcaa 360
ctggttacgc aggcgatcgc caataagaag aaattgcaga ctgcaaacaa tgccttgatt 420
gccaaggcac ccaatgcact ggagaaacaa aaggcaacct acaacgccga tctcctagtg 480
gatgaaatcg ccagcctgca agcacggctg gacaagctga acgccgaaac ggcaaggcgc 540
aaggaaatcg ctcgtaagc ggcgatcagg gctgccaata cttatgcca 589

<210> 515
<211> 710
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 515
atccagtata ttctgctcg atcaagctac ggtactccac catttgtccc accaggacca 60
agtccgtatg tcggtactgg aatgcaggag tacaggaagc taagaagtac gcttgataag 120
tcccattcag aactcaagaa aaacctgaaa aatgaaaccc tgaaggaggt tgatgaactc 180
aagagtgaag cggggttgcc aggtaaagcg gtcagtgcc aatgacatccg cgatgaaaag 240
agtatcgttg atgcactcat ggatgccaaa gcaaaatcgc taaaggccat tgaggatcgc 300
ccggccaatc tttatacggc ttcagacttt cctcagaagt cagagtcgat gtaccagagt 360
cagttgctgg ccagccgaaa attctatgga gagttcctgg atcgccatat gagtgagctg 420
gccaaagcgt acagcgccga tatctataag gcgcaaatcg ctatcttgaa acaaacgtct 480
caagagctgg agaataaagc ccggtcattg gaagcagaag cccagcgagc cgctgctgag 540
gtggaggcgg actacaaggc caggaaggca aatgtcgaga aaaaagtgca gtccgagctt 600
gaccaggctg ggaatgcttt gcctcaactg accaatccaa cgccagagca gtggcttgaa 660
cgcgctactc aactggttac gcaggcgatc gccaaataaga agaaattgca 710

<210> 516
<211> 752
<212> DNA

<213> Pseudomonas aeruginosa

<400> 516

tcgccaataa gaagaaattg cagactgcaa acaatgcctt gattgccaag gcacccaatg	60
cactggagaa acaaaaggca acctacaacg ccgatctcct agtggatgaa atcgccagcc	120
tgcaagcacg gctggacaag ctgaacgccg aaacggcaag gcgcaaggaa atcgctcgtc	180
aagcggcgat cagggctgcc aatacttatg ccatgccagc caatggcagc gttgtcgcca	240
ccgccgcagg ccgggggtctg atccaggctg cacaaggcgc cgcacccctt gctcaagcga	300
tctccgatgc gattgccgtc ctggggccggg tcttggttc agcaccctcg gtgatggccg	360
tgggctttgc cagtctgacc tactcctccc ggactgccga gcaatggcag gaccaaacgc	420
ccgatagcgt tcgttacgcc ctggggcatgg atgccgctaa attggggctt cccccaagcg	480
taaacctgaa cgcggttgca aaagccagcg gtaccgtcga tctgccgatg cgcctgacca	540
acgaggcacg aggcaacacg acgacccttt cgggtggtcag caccgatggg gtgagcgttc	600
cgaagccgt tccggtcgg atggcggcct acaatgccac gacaggcctg tacgaggtta	660
cggttccctc tacgaccgca gaagcgcgc cactgatect gacctggacg ccggcgagtc	720
ctccaggaaa ccagaaccct tcgagtacca ct	752

<210> 517

<211> 739

<212> DNA

<213> Pseudomonas aeruginosa

<400> 517

atcgttctgg tcttccttgc agcgttggtg tggatgctga gtgcaggcag tatctccggc	60
ggctgggggg gggcgatgct ggggtgcagg tctggcgtgg cactgttagg gttcctggat	120
gaccatgggc acattgctgc gcgttggcgg ctgctcggcc atttctcagc agcgatatgg	180
atcttgctgt ggacgggtgg tttcccgccg ctggatgtgg ttgggcatgc tgtcgactta	240
ggatggctgg gccacgtatt ggcagttttc tatttggtat ggggtgctgaa cctttataac	300
ttcatggatg gcattgatgg tattgccagt gtcgaggcca ttggtgtctg tgtaggaggg	360
gccctgatct actggcttac agggcatgtc gcgatggttg gtatccctct gttgctggcg	420
tgcgcggtcg ccggcttcct gatctggaac ttccctccag ctogaatctt catgggtgat	480
gcggggagtg gttttcttgg tatggttatt ggtgcactag ctattcaggc tgcattggacc	540
gccccctcgc tgttctgggt ctggttgata ttgctgggag tgttcacgt tgatgcaacc	600

tataactctga tccgccggat cgccagaggg gagaaattct atgaggcgca tcgcagccac 660
gcttatcagt ttgcctcgcg tcgttatget agccatctgc gggttacctt ggggtgttctg 720
gctatcaaca ctcttttgt 739

<210> 518
<211> 756
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 518
agtctgttgg tatcggtttg caagggcctg cgggtacatg tcgagcgcg tgggcaggat 60
cccgggcgca gcacgggtgat gctgggtcaac ggcgcgatgg cgaccaccgc ctcgttcgcc 120
cggacctgca agtgccctggc cgaacatttc aacgtgggtgc tgttcgacct gcccttcgcc 180
gggcagtcgc gtcagcaciaa cccgcagcgg gggttgatca ccaaggacga cgaggtggaa 240
atcctcctgg cgctgatcga gcgcttcgag gtcaatcacc tggctctcgc gtcctggggc 300
gggtatctcca cgctgctggc gctgtcgcgc aatccgcgcg gcatccgcag ctcggtggtg 360
atggcattcg cccctggact gaaccaggcg atgctcgact acgtcgggcg ggcgcaggcg 420
ctgatcgagc tggacgaciaa gtcggcgatc ggccatctgc tcaacgagac cgtcggcaaa 480
tacctgccgc cgcgcctgaa agccagcaac catcagcaca tggcttcgct ggccaccggc 540
gaatacgagc aggcgcgctt tcacatcgac caggtgctgg cgctcaacga tcggggctac 600
ctggcttgcc tggagcggat ccagagccac gtgcatttca tcaacggcag ctgggacgaa 660
tacaccaccg ccgaggacgc ccgccagttc cgcgactacc tgccgcactg cagtttctcg 720
cgggtggagg gcaccgggca tttcctcgac ctggag 756

<210> 519
<211> 473
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 519
aacgctttct cgatcagggc agccggccgc tgggtgttcac ccagggctcg accgaacacc 60
tgcagggcga cttctacgcc atggccctgc gcgcgctgga acgcctcggc gcgcgtggga 120
tcttcctcac cggcgccggc caggaaccgc tgcgcggctt gccgaaccac gtgctgcagc 180
gcgcctacgc gccactggga gccttgctgc catcgtgcgc cgggctggtc catccgggcg 240
gtatcggcgc catgagcctg gccttggcgg cgggggtgcc gcagggtgctg ctgccctgcg 300

cccacgacca gttcgacaat gccgaacggc tggctcggct cggctgcggg atgcgcctgg 360
gcgtgccatt gcgcgagcag gagttgcgcg gggcgcgtgtg gcgcttgctc gaggacccgg 420
ccatggcggc ggcctgtcgg cgtttcatgg aattgtcaca accgcacagt atc 473

<210> 520
<211> 459
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 520
ttcgattact acgcctatgg cgtgcgccac acgattccct tcacccggcc gaagaccgag 60
gtccatggca cctatcccaa ggcctggctg gagcgatacc agatgcagaa ctacggggcc 120
gtggatccgg cgatccctcaa cggcctgcgc tcctcggaaa tggtaggtctg gagcgacagc 180
ctgttcgacc agagccggat gctctggaac gaggctcgcg attggggcct ctgtgtcggc 240
gcgaccttgc cgatccgcgc gccgaacaat ttgctcagcg tgctttccgt ggcgcgcgac 300
cagcagaaca tctccagctt cgagcgcgag gaaatccgcc tgcggctgcg ttgcatgac 360
gagttgctga cccagaagct gaccgacctg gagcatccga tgctgatgtc caaccggctc 420
tgctgagcc atcgcgaaac cgagatcctg caatggacc 459

<210> 521
<211> 519
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 521
cccctattcc ataccttacc tatatcgccc gtcccggcat caataaatTT gatcttcttg 60
aaggggagaa aatcaaggat ctgattaagc gctatcagta tattgggttg caaatcccgg 120
cagcaatcat gattcgtggg gtgcaggaag agatcaaaaa atccacgaac actgccttgg 180
ccaatgtggg ggcaattgtc gatggcgaac tggcgtatct tgctagccag aaaaaggaaa 240
aattaaatcc tgccgaggcg acacccttgc agatggcctc tgctgaaaag gccgcggcgg 300
tggaactgct tgcgtccaaa cagaaggaac tggctgacgc acgaaccatt gcaaatgcat 360
tctttggcta tgaccctctc acgggtcaatt atgttaatgt aatgaatgaa atctacggcc 420
gccgcgaaga taaagatttc agtttcgaca actggtcgaa gtcttattca gccgcacaaa 480
agatccgctt gatcgaagcg aaaatcagcg tcctcaata 519

<210> 522

<211> 417
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 522
gtgcgctaca gctacacgcg ccaggcgcg gcaggttggt cgctgaactg gctgggtgccg 60
atcggccacg agaagccttc gaacatcaag gtgttcatcc acgaactgaa cgccggtaac 120
cagctcagcc acatgtcgcc gatctacacc atcgagatgg gcgacgagtt gctggcgaa 180
ctggcgcgcg atgccacctt ctctgtcagg gcgcacgaga gcaacgagat gcagccgacg 240
ctcgccatca gccatgccgg ggtcagcgtg gtcattggccc agggccagcc gcgcccggaa 300
aagcgttga gcgaatgggc cagcggcaag gtgttgtgcc tgctcgaccc gctggacggg 360
gtctacaact acctcgccca gcagcgctgc aacctcgacg atacctggga aggcaag 417

<210> 523
<211> 573
<212> DNA
<213> *Streptococcus pneumoniae*

<400> 523
actcttggt tgattttggg tgactctaag ctgatacctg ggtcaggagt gaacattgaa 60
aagtatcctg tgcaacagta tccaaatggt ggaaatggaa ttcaaggaga aacaatcgtt 120
tttaatttta ttggtaggat attaaaagaa aaaggtatag atacttatct ggctgctgcc 180
caaattatta agagtcgata tcccaaaaca gagtttaata ttattggctt tatagaaccg 240
acagagagta attatgaact taaaatttgt gacttagaaa aaaaaggaat cgtttattat 300
ttgggacaac aaaaagatgc gatacctcat attaccggtt cccatgcaat tatccatccc 360
agtgtgtatg gtgaaggaat gagcaatgta ttactagaaa acgctagttc aggacgtgtt 420
ttaattacga cagataatcc aggttgcaaa gaaattgtta aagatagaga gacaggctat 480
atatttcaag ggggaaatgt tgaggaacta gtctctatat tggaagtttt ttaggtcta 540
gaaaatgaaa aacgaaaaga gatgggactt caa 573

<210> 524
<211> 535
<212> DNA
<213> *Streptococcus pneumoniae*

<400> 524
aaatattgtt gggttacttc gtgcaaatat ttgcttgata ttattaaaag tgtgtcgaaa 60
caaggatctt acttttcatt attttttaaa atttggaag aatgtaactg tcgaacagga 120

atctaattgct aaattaatct taggaaaaaa gatttagagta aacgccgggg gagtattgaa 180
agttagaaaa ggagcaaaac tcaagatttc tgatgatgta tttttgagta ataattgtat 240
gatagcttgt cgtaaataca tagatattaa atctggagta aaatgtggtc ctggagtact 300
tatatatgat catgactatg atgttagtgt tccaggtgga ttgaaagcaa aaaaatttaa 360
gacggcccca gttatgattg gagaaaatgt ttggattgga gctaacagca ttgtcttgaa 420
gggagtgagt attggtgaga atagtgtggt tgcagcagga agtgttgtaa caaaggatat 480
tccagctgat actatatatta ttcagaaacg tttatcaagg gagatgaaat tatga 535

<210> 525
<211> 691
<212> DNA
<213> Streptococcus pneumoniae

<400> 525
ctaaagcatt tggagagatt gtactatgta gtcgttatga gaaggtggaa tcataccctg 60
aaggatatca taaagcgaac tttattaata aatttatccc tatagaaggt ctacatcagg 120
ttctatttgg tcaaaataaa aataagatta ttgaaggaat gattgatagc gacttaatag 180
ttgttcgtat tccgtctata attggatcaa aaactgcaga ctacgcattg aagataggta 240
agccgtatct gacagaaata atgggggatg cttgggattc ttactgggat catagtttaa 300
agggaaaatt attagctcca tatatatagc ccaaaactaa atcaattgta aaaaacgcta 360
attattgcat atacgtgaca gaaaaatatt tacaagatag atatcctaatt attaaatcta 420
atatcgttgc ttcaaattgtt aatattacct ctgtagagaa tagatctttg aagagccgtc 480
tttataagtt gaaaaaattt aatcctcaaa aaatttcaat aatgacaaca gcatctgtga 540
atgtacgagc caagggccat agatttgtat tggaagcaat gaagagatta gaaatacaag 600
gtattttggt ggattattat ttagcagggt atggtgatca aagtttctta aaaaagaaag 660
cagaggaatt gggagtagcg aatagaatcc a 691

<210> 526
<211> 509
<212> DNA
<213> Streptococcus pneumoniae

<400> 526
tgttaggaact gatttggatg attctgagtt aacaaaaaga gcatggcagt ttgcagatct 60
acttaaaggt ggagctatta aggaagaggt tccgatactg gttgttgctt ttaatgaagc 120

agagggttgca aaattgttta gtaacactta cttggcaact cgcgtacgtt attttaatga 180
gatagatata tatagcgagg taaaagggtt taatcccaag acaattattg atattgtttg 240
ttatgatcct agaattggat catactataa taaccctagc tttgggttacg gagggatttg 300
cttaccaaaa gacacaaagc aattgaaagc aagtttttagg gatgttcctg aaaatctgat 360
tacagctgtg gtgcaatcta ataaaacaag aaaagattat atagctggag ctattctagc 420
taaacaacct agtgtttagt gtatttatag attaattatg aaatctgatt ctgataattt 480
tcgttctagt gctgttaagg gagttatgg 509

<210> 527
<211> 695
<212> DNA
<213> Streptococcus pneumoniae

<400> 527
tttccagaca taaaccatcc gaaattattg tggttattaa cggcccaaaa aacgagagac 60
ttgtaaaact ttgtcatgat tttaatgaaa aattagaaaa taatatgact ccaattcaat 120
gttattacac tcctgttcct ggcaagagaa atgctatcct ctttgggctg gagcatgtgg 180
attcgcagag tgatattaca gttctagtag atagtgatac agtatggacg cctagaacct 240
tgagtgagtt gctgaagcct tttgtttgctg ataaaaaaat aggtggggta acgacaagac 300
aaaaaattct tgaccctgag cgtaatctcg tgacaatgtt tgctaacttg ttagaggaaa 360
ttagggcaga aggaactatg aaagcaatga gtgtgactgg taaagtaggg tgcttacctg 420
gtcgaacaat tgctttttaga acagagattc tcagagagtg tatacatgag tttatgaatg 480
agactttcat gggattttcat aaggaagttt ctgatgatag aagtcttaca aatttgactt 540
taaaaaaagg ctataaaact gttatgcagg atacttctgt tgtgtataca gatgctccta 600
caagttggaa aaagttcatt agacagcaac taaggtgggc agaaggttct cagtataaca 660
atctaaagat gactccttgg atgattagaa atgcc 695

<210> 528
<211> 542
<212> DNA
<213> Streptococcus pneumoniae

<400> 528
tcgtcatctg tactgggtctg ggcttgcttg taggaggatt tttcctgcta aaaccagctc 60
caciaaacacc tgtcaaagag acgaatttgc aggctgaagt cgcagctgtt tccaaggatt 120

tggtatccga aaaggaagtg aacaaggaag aaaaggaaga accccttgaa caagatctaa 180
tcacagtaga tgtcaaaggt gctgtcaaat cgccagggat ttatgacttg cctgtaggta 240
gtcgaatcaa tgatgctgtt cagaaggctg gtggcttgac agagcaagca gacagcaagt 300
cgctcaatct agctcagaaa gttagtgatg aggctctggt ttacgttcct actaaggag 360
aagaagcagt tagccaacag actggtttgg ggacagcttc ttcaataagc aaggaaaaga 420
aggtaaatct caacaaggcc agtctggaag aactcaagca ggtcaaggga ctgggaggaa 480
aacgagctca ggacattatc gaccatcgtg aggcaaattg caagttcaag tcagtagacg 540
ag 542

<210> 529
<211> 545
<212> DNA
<213> Streptococcus pneumoniae

<400> 529
gtggaaatct gctggtaaag ttctaataat ttgcggaatc tttggatttt ggtttgtttt 60
tcaaaattgg caacagagtc aagcgagtca aaatctggcg gattctgttg aaagggtagc 120
gattctgcct gacactgtta aggtcaatgg tgatagtctg tcctttcgcg gcaaggctga 180
tggaacgatt tttcaagtct attataaact ccagtccgag gaggagaaag aagcctttca 240
agctttaacc gacctgcatg agataggact agaagggaag ctttcggagc cagaagggca 300
gagaaatttt ggtggcttta attaccaagc ctatctgaag actcaggga tttaccagac 360
tctcaatatc aaaaaaatcc agtcacttca aaagattggc agttgggata taggagaaaa 420
cttgtccagt ttacgtcgaa aggctgtggt ttggattaag acgcactttc cagaccctat 480
gcgcaattac atgacaggac tcttgctggg acatctggac accgactttg aggagatgaa 540
tgagc 545

<210> 530
<211> 402
<212> DNA
<213> Streptococcus pneumoniae

<400> 530
gattatcggg gaaattcgtg acagcgagac ggcgcgtgca gtggtcagag ctagtttgac 60
aggatgcgaca gtcttttcaa ccattcacgc caagagtatc cgaggtgttt atgagcgtct 120
gctggagttg ggtgtgagtg aagaagaatt ggcagttggt ctgcaaggag tctgctacca 180

gagattaatc gggggaggag gaatcgttga ctttgcaagc agagattatc aagaacacca 240
agcagccaag tggaatgagc aaattgacca gcttcttaaa gatggacata tcacaagtct 300
tcaggctgag acggaaaaaa ttagctacag gctaagcaaa aaaatatcat caccctatct 360
aacaatctct tttctagcgg ttttcatctg gtggagacta tc 402

<210> 531
<211> 463
<212> DNA
<213> Streptococcus pneumoniae

<400> 531
tggacaagca gtgtgtgacc cagatgcgtg tgggcttgct tcaggggaaa tcattctcag 60
aaatgatgga aagtttggga tgttcaagtg ctattgtcac tcagttatcc ctagctgaag 120
ttcatggcaa tctccacctg agtttgggaa agatagaaga atatctggac aatctggcta 180
aggtcaagaa aaaattgatt gaagtagcga cctatccctt gattttgctg ggttttcttc 240
tcttaattat gctggggcta cggaattacc tgctcccaca actggatagt agcaatattg 300
ccacccaaat catcggtaat ctgccccaaa tttttctagg catggtaggg cttgtttccg 360
tgcttgccct tttagcactc actttttata aaagaagttc taagatgagt gtcttttcta 420
tcttagcacg ccttcccttt attggaatct ttgtgcagac cta 463

<210> 532
<211> 322
<212> DNA
<213> Streptococcus pneumoniae

<400> 532
aaaaatgatg acattcttga aaaaagctaa ggttaaagct tttacattgg tggagatggt 60
ggtggtcttg ctgattatca gcgtgctttt cttgctcttt gtacctaatc tgaccaagca 120
aaaagaagca gtcaatgaca aaggaaaagc agctgttggt aaggtggtgg aaagccaggc 180
agaactttat agcttagaaa agaatagaaga tgctagccta agaaagttac aagcagatgg 240
acgcatcacg gaagaacagg ctaaagctta taaagaatac catgataaaa atggaggagc 300
aaatcgtaaa gtcaatgatt aa 322

<210> 533
<211> 380
<212> DNA
<213> Streptococcus pneumoniae

<400> 533
atgctggaaa gtctcttgggt tttgggactt gtgagtatcc ttgccttggg cttgtccggc 60
tctgtccagt ccactttttc agcggtagag gaacagattt tctttatgga gtttgaagaa 120
ctctatcggg aaacccaaaa acgcagtgtg gctagtcaac aaaagactag tttgaacttg 180
gatgggcaga tgattagcaa tggcagtcaa aagttgacag ttcctaaagg aattcaggca 240
ccatcaggcc aaagtattac atttgaccga gctgggggca attcgtccct ggctaagggt 300
gaatttcaga ccagtaaagg agcgattcgc tatcaattat atctaggaaa tggaaaaatt 360
aaacgcatta aggaaacaaa 380

<210> 534
<211> 547
<212> DNA
<213> Streptococcus pneumoniae

<400> 534
ggctgtagga gacaatgaag ttcgtctctt gtctttgctt gagattgcca gtcaacgtag 60
cagtctggtg attttgacag gcggtttggg ggcaactgag gacgacctaa ccaaacaac 120
cctagctaaa tttttaggga aagcattagt ctttgatcct caggctcagg agaagttgga 180
tatctttttt gccctgcgac cagactatgc ccgaacaccg aataacgaaa gacaagctca 240
aattgtagaa ggagcgattc cactgccaaa cgaaacagga ctggctgttg gaggaaaatt 300
agaagtagac ggagtgacct atgtcgtcct tccagggtccg ccaagtgaat tgaaacccat 360
ggctcttaaac caacttctac ccaagttgat gacagggagc aagctgtatt cccgagttct 420
tcgtttcttt gggattggcg agagccagtt ggttacgatt ttggctgatt taattgataa 480
tcagatcgat cctaccttgg ccccttatgc caagacagga gaagtcactc tacgtctgtc 540
aacaag 547

<210> 535
<211> 520
<212> DNA
<213> Streptococcus pneumoniae

<400> 535
ttgttagaga gacagaactt gaacgttctt cgatgggttat actatacctt ctccactttt 60
ttgtattcta ttttagttcc tatggtaaca aattttttta aagagggtag ctagttgagt 120
ttaatagtag tataagatat atttttttct ttgcaatagc tataagtgtg ttaaactttt 180

ttatagcgga acggttttagt atctctagaa gaggaatggt atactttctta acttttagaag 240
gaatatcctt atacttggtta aattttcttag taaagaaata ttggaagcat gtgttttttta 300
atccaaaaaa tagcaagaaa attttactgt taacagtaac ggaaaatata gaaaaagttc 360
ttgataaatt gctagaatct gatgaacttt catggaaact ggtagcagta agtggttttg 420
ataaatctga ttttcaacat gataaaatac ctgtaattga aaaggaaaaa attattgaat 480
ttgcaacgca tgaagttgtg gatgaggtgt ttgtcgatct 520

<210> 536
<211> 210
<212> DNA
<213> Streptococcus pneumoniae

<400> 536
aatattttat ccatgttatt atcctactaa tcgtaatcta aaaaatctta ttaaaaatac 60
gattcttgct ttcaaaattt tgagaaagga acgccctgat attatcgtct catcaggggc 120
agctgtagca gttcctttct tttatctagg gaaaatattt ggtgctaaga cagtctatat 180
agaagtattt gatagaattg atgctccgac 210

<210> 537
<211> 405
<212> DNA
<213> Streptococcus pneumoniae

<400> 537
tgagggattt attcaggatg atgtttttat tcaaacagga tactctaatt atgttccaaa 60
attttgtaaa tgggaaaaat taatatctta tgaaaaaatg aatcaattga ttaaggaatc 120
agatattatc attacccatg gcggtccagc tacgtttatg gcagttattg ctaaaggtaa 180
aaatccaata attgttccgc ggctaaaaaa atttggtgag catgtaaattg atcaccagat 240
gcaatttgta aaaataacga aagaaatata caatttaata gttatagatg atatttcaga 300
cttacattta attcttcata attttaagga caaacatttt gaaacttatt tgaataacga 360
gagatttaat gtacgtttca atgtggaaat cagtaacctt tttaa 405

<210> 538
<211> 622
<212> DNA
<213> Streptococcus pneumoniae

<400> 538
tgctttaact cttttaccaa cctatatataa agaaaaacaa gtttttaaaa tagatacacc 60

gtctttttgt atggtgctat ggactattat atattctata tctataatat ttaattctct 120
gattgatgga ttggctgttc aagtgttatt ttcagatttg agtaaagcat ttaattggct 180
aatagcagta tttttttata attattattt gaaaatgcca atcaatattg acaggataaa 240
gagatatatg tattataatt ttactatctt agttgttttt gtcggtttat tctatataca 300
aagaggctcc aatgtaattt tgtttggaag aagtttgta gactgggacg gatttacatt 360
agctactagt tatggtgtaa gatatacagg ttttttagaa tacgcaactt taaatggcca 420
gttaattctt tttttattac cgtaattag attgtttaga tttagatttt ttacacaaac 480
tatcattttt gcttttcttc tagaggtttt ggtactaagc aaatctagaa tagcgattgt 540
tgcaatgctt atatatatag catttgcagt agtcaatgag attaattcaa acaataaatg 600
gcttattgga attttctgtc ca 622

<210> 539
<211> 687
<212> DNA
<213> Streptococcus pneumoniae

<400> 539
aaggcaattc caatacaaag cagatcgta ttattgataa tttttctaata aacgggtacgg 60
gtgaaaaact acaagagctg tatgagtcag attcagagat tgatgtcttg attaaccatg 120
aaaatgctgg tttcgctcga ggtaataatg tagcatatca gtttgctaag gaaaagtaca 180
aacctgattt tatggttatc atgaataatg atattgagat agaaacagaa gagtttgaaa 240
aaatcgtgac agatatctat cggaaggaaa aattccattt gttaggacca gatatctttt 300
cgacgacgta tcagcttcac caaaacccaa aacgggtgac gcattatact tatgaagagg 360
ttaaggctct caatgaaaaa ttaagaaag ggagccaagt tagtctagca ttaaaaatta 420
aatgttggtt gaagtctagt aaagttcttc ggacagcaat ctatcaaaat aggcgtaaaa 480
agaaatcagt agactataga aaacaggtag aaaacccaat tcttcatggt tcgtttattg 540
tatattctag agatttaatt gagaaagagg agtatgcttt taatcccaat accttcttct 600
attatgaaac agagatatta gattatgaag ctgagttaaa aggatataag agaatttata 660
caccgaagat taaggtcttg caccatc 687

<210> 540
<211> 534
<212> DNA

<213> Streptococcus pneumoniae

<400> 540

tttcaatgcc tctcttggt cttaatcgc ctagtctaaa taccaagatt aaagtgcgg	60
atcggtcat tgatatccaa ttctggaaaa tagctcttac tattatagtt gacctatta	120
ttctatatct ttataggaga gagattcata atcttgcaact tagccatggt tatacgggtt	180
caaattttca gtggttcttt agaaatgcta ccagttatga aggtgagcta acagtgcgaa	240
cttcgattcg ggtcctcatt cgtatcattg acgtatctgc ttatatTTTT ggatatactt	300
ttattaataa tttcttcatt tatagtcata aacgctctaa agatttactg ctcttagttc	360
cattcttgat ttttatttct aaaaccttat tatctggggg tagattggat attataaaaa	420
ttttaattgc gtatgttgta atggcctata ttcagcaaaa acgaaaagtt ggctgggata	480
aggtcatctc ccataaatat atgagacttg gttttgtagg cttgatagct ggga	534

<210> 541

<211> 450

<212> DNA

<213> Streptococcus pneumoniae

<400> 541

tccattagtc aatgagttga aaaaacacga agatatggaa acaattgtgt gtgttactgg	60
acaacacaaa gagatgggta gtctgtttt agatttattt ggtgttgtag cagattatga	120
tttagaaatt atgaaggcta accaaacctt gttctctatc acaactagta tcttggaaaa	180
gataaaacca gtttttagaga aggaacaacc agatattgtc ctagttcacg gtgacactac	240
gacaacttat gcagcagcct tggcagcatt ctatttggga attaaagtag gacatgttga	300
agctgggttg cgaacgtaca atttacaag tccatttcct gaagaattta acaggcaatc	360
gacatcaatc attgcaactt accattttgc tccaactgag ttggctaaag aaaatctctt	420
aaaagaaggt agagagaatg tttatgtgac	450

<210> 542

<211> 565

<212> DNA

<213> Streptococcus pneumoniae

<400> 542

gaagcatacg acaaacttcc aagtgttttc aaagatagaa ttatcgctgg gaaatatcag	60
gttcttactt atcaatactg tgatacgttg cattgctact ttctcgact attcctttta	120
gcagatgaaa gaaaacgttt gggcttgcca cgaaatacca atctaggatt gcatttgatt	180

gatatcattc ctttagatgg agcaccaaatt cattcgggtt taagaaagat ttacttttgt 240
aaagtatact ggtatcggtt ttttagcaagc ttaggaacaa cttatgttgg cgaccatgtg 300
gatatgcatt ccactaagca aaaactaatt attgggttct ttaaaaaact aggatttgca 360
aaactatttc ctcaaaattc tgtatacaga cgcttggata atctctatag aaagtatgat 420
tggaaaaagc agaagtatgc ggggactatc aatgcttctt tatttgctaa agaagttatg 480
ccagtagaga tttggggaga aggagtagag aagccttttg aggatacctt ctttaaagtt 540
ccaacggagt atgatcgcta cctga 565

<210> 543
<211> 662
<212> DNA
<213> Streptococcus pneumoniae

<400> 543
gtgatagtga acttgggatt gtctagtatt attcagtaca tttcttattt tatgttgatg 60
ttgtgtgtat ttttaacatt aattaagaat actctcaacg tgtttgcaaa tagaatcata 120
tattttttga ttatttcatt tttgtttatt attgggatta atttacaaaa tcttccatta 180
tcaagaaaga tttattttatc attctctatg ttaattattt ctagcttata caccttaccg 240
ataaagctaa taaataatct cagtgattta agaaggatat catattactt attgcacagc 300
atatttttat ctgtattttt aggtttgggt tttaaaatat ctttagtaac agttgctgta 360
gaggggaattg gcttttcata tggttttaat ggaggtttga ctcataaaaa tttttatgca 420
attacaattt tagtttccta tattctacta tatgtcagca gaaaatatga cgctaaacat 480
cagattgata gttttgtatt atggtttagat ctttttttac ttttaatatc taatacgaga 540
acagtttata taatactagt tgttttttgg attattatta atagaaattt tataaataat 600
attaaaaaag agcatagact ggtagtgaac gcaacgacaa tagtcatctc tttactggcg 660
tt 662

<210> 544
<211> 380
<212> DNA
<213> Streptococcus pneumoniae

<400> 544
agagcaaaaa cgctgggttc tcaacaggtc aaccttgggt ggcggttaat ccaaattacg 60
agatgatcaa cgtacaagaa gcgctggcaa atccagattc tattttctat acctatcaga 120

aactgggtcca aattcgcaag gagaatagct ggctaattcg agctgacttt gaattgcttg 180
atacgggtga taagggtcttt gcttatatac gtaaggatgg cgaccgtcgc ttcctagttg 240
tggctaactt gtccaatgaa gagcaagact tgacagtaga aggaaaagtc aaatctgtct 300
tgattgaaaa caccctagct caagaagtct ttgaaaaaca aatcttagtt ccatgggatg 360
ctttctgtgt ggaattacta 380

<210> 545
<211> 610
<212> DNA
<213> Streptococcus pneumoniae

<400> 545
acgaacagtg gacctgatac atgggtccgat tcttccctcg ctcttaagct tcacctttcc 60
aatcttgcta tcaaataattt ttcaacagct ctataacact gctgatgtct tgattggttg 120
acgattttctt ggtcaagaat ccttggctgc agtaggagcg acgacagcga tttttgacct 180
gattgtaggc tttaaccttg gtgttggtcaa tggcatgggg attgtcattg ctcgttatta 240
tggggctcgg aatttcacta aaatcaagga agcagtagca gccacctgga ttttaggtgc 300
tcttttgagc attctagtta tggtgctggg ctttcttggc ttgtatcctc tcttgcaata 360
cttagatact cctgcagaaa ttcttccctca atcttatcaa tatatttcta tgattgtgac 420
ctgtgtaggt gtcagctttg cttataatct ttttgcaggc ttgttgcggt ctattggtga 480
cagtctagca gccctgggat ttctgatttt ctctgccttg gttaatgtgg ttctggatct 540
ctattttatt acgcaattgc atctgggagt tcaatccgca ggacttgcta ccattatttc 600
gcaaggttta 610

<210> 546
<211> 546
<212> DNA
<213> Streptococcus pneumoniae

<400> 546
ttgtcttgac tggttgtgtc aatgtcgata aaaccacagg tcagccaaca ggattttattt 60
ggaataccat cggagcccct atggctgaag ctatcaagta cttcgctact gataaaggtc 120
taggcttttg tgctgctatc atcatcgtaa ccattatcgt gcgcttgatt atcttgccac 180
ttggtatcta ccaatcatgg aaggcaacgc ttcactctga aaagatgaac gccctcaagc 240
acgtccttga gccacaccaa acgcgtctca aagaagcgac tactcaagaa gaaaaactcg 300

aagcccaaca agctctcttt gctgctcaaa aagagcacgg tatcagcatg tttggcggtg 360
taggatgttt ccctatcctc cttcaaattgc ctttctttctc tgctatctac tttgctgccc 420
aacatactga aggggttgct caagcaagct acctaggcat tcctctaggt tctccaagta 480
tgatttttgt tgctgtgct ggtgtccttt actatcttca atcgctcctt tcacttcacg 540
gagtag 546

<210> 547
<211> 262
<212> DNA
<213> Streptococcus pneumoniae

<400> 547
tgcaaaaggt tagaatgatt gcccaaggta gggtagagg agtcggcttt cgttggggtg 60
tttacagctt ggcacttgaa attggtggca tcacaggctc agtatggaat aacgacgatg 120
gcacagtgga aatcttagcc caagcagact catctgctat catggcaaaa tttatccaag 180
aaatccgaaa aggaccgaca cttttttcaa aagtaagcta cttagatgtc aaactaagca 240
actttcctcc ctactctgac tt 262

<210> 548
<211> 629
<212> DNA
<213> Streptococcus pneumoniae

<400> 548
gttcggtaat ccagttgaag tcccttttga acattgggaa ctagaacatt gaattccaat 60
tctccatccg aagacttggc ttcaatctgt gaagctgagg gaactaaatc ctcgtttgaa 120
gcgtagtaaa gggttacacg gtaacggaca cgcttgtttt ggtccaaggc tttacgcacc 180
ttgctttcat agtagttttg accagtcgaa tactcggctt gtgcctgatt tgcccaggct 240
gtctgaacag caatgttttt aggattgctt gttgaggcat caaaaccatc caaaccaccg 300
attaaggcat agcctaacia atgacctcta tcgactgcat gggataaga gccctttaga 360
ttcttgacct gatgccaacc tggaggagtc caagaagttg aaccattccc agtttcttta 420
cgattcttgt actgacgagt ggccttagac aagagggcat tagctacggt tggaacagtt 480
tccttgccca ctgtctttgt tttattgtca gcgtagggct tacttgaaac cttggcatct 540
agatttggtt tattaccatt gacgataaaa gcacctgagc cattccactc cagactcccc 600
tttatttgac tcttgactgc gtctgttaa 629

<210> 549
<211> 323
<212> DNA
<213> Streptococcus pneumoniae

<400> 549
cgtggaaatt ttagaagaac tcttcccagg ctacgaaaac acgtggcggt cttcccaaga 60
gcctgcccgt aaaggctatg ctggaaccat gttcctttat aagaaagaac ttacacctac 120
tatcagcttc ccagaaatcg gtgccccttc taccatggac ttggaaggtc gtatcatcac 180
tctagaatth gatgcattth tcgtaacca agtttacact ccaaacgctg gtgacggtct 240
caaacgcttg gaagaacgcc aagtctggga tgccaaatat gctgagtatt tggctgaact 300
agacaaagaa aaaccagtcc ttg 323

<210> 550
<211> 206
<212> DNA
<213> Streptococcus pneumoniae

<400> 550
aaaatttggg ggattcagtt agctgcaatt aaaaaaattg gtgttttgag ggaagaacgt 60
ataagcccca atcagctttg gcatgcactg gaaacagatt atgccggaga agaaggtaag 120
gtcattcaag aaatgttgat tcatgatgca cctaagtatg gtaatgatga tgattatgct 180
gacaaattgg ttactgctgc ttatga 206

<210> 551
<211> 510
<212> DNA
<213> Streptococcus pneumoniae

<400> 551
cctctaaggc tatgatggaa aagattgctg ttgctaagtc aaggacggta gaagaagatc 60
agacaaaagt ctgtgtaact cgctacggca atgttctatg tagtcgtggg tctgtgattc 120
ccctatggat tgatcaaata aagcaaggga atcctataac gattacggaa cctagtatga 180
ctcgttttat tatgtcctta gaagaagcgg tagacctagt tctgtttgct ttgaaaaag 240
gaaaaacagg agatatacta gtacagaaag caccagcatg taccattgaa gtgttggcgc 300
aagctgttac ggaacttttt gcacctaatc aagatattaa agtaatcggg attcgccacg 360
gtgaaaagat gtatgaaacg ttgttgacta ctgaagaatg tacgaatgcc attgatttag 420

gcggcctttta tcgtgtgcct agcgataatc gagatcctaa ctatgataag tatttcaacg 480
aaggggatgc caaacgcaat cccttaatag 510

<210> 552
<211> 589
<212> DNA
<213> Streptococcus pneumoniae

<400> 552
tgaaagatgg acgagatagg actcgtccta atttagagat tggagagatt tttcagtatg 60
atcgtgatac agatccgatt ttattagatg aatattgtaa gaaggccgat ttcgtattcc 120
atttagctgg tgtcaatcgt ccacagaatc ctgatgaatt catggaggga aattacgggtt 180
tttcaagtag attattggag attttagaaa agtatgaaaa cacttgtcct gttctactct 240
caagttctac tcaagctagt ttagaaggcc gattttcaaa ctctatatat ggacaatcta 300
agctagtagg ggaagaactc ttctttgaat atggaaagaa aacgggagca cctgtcttag 360
tttaccgttt cccgaatctt tatgggaagt ggtgccgtcc taactacaat tctgctgtag 420
caactttctg tcataatcta gctcacgatt tacctattca agtaaagat ccaagtgtag 480
aattggagtt gctgtatatt gatgatttga tacaagagtg tctaactgca ttggaaggaa 540
atcctcatcg ttgtaatcta gatggattac aaatcttacc tagcccatc 589

<210> 553
<211> 545
<212> DNA
<213> Streptococcus pneumoniae

<400> 553
tacatggatg ctgttggaga tgatcttggg gctactgtag ggaatattat taatacttca 60
tacaaattga tgaatcaaata taaaccagat gctttattga ttttagggga tacaaattct 120
tgtttatcag ctattactgc caagcgttta catattccaa tttttcatat ggaggctggc 180
aatcgctgta aggatgagt cctgccggaa gagactaatc gtcggattgt tgatattatt 240
tcagatgtta acttagcata ctctgaacat gcacgtaagt atttacatga gtgtggttta 300
cctaaagagc gcacatatgt aacaggttct cctatggcag aagtgttaca taaaaattta 360
tctgccattg agtcttcaga tatccatgaa cgtttgggat tgaaaaaagg aggttatatc 420
ttactttcag ctcacgtga ggaaaatatt gatacagata aaaattttat ttctctcttt 480
acagcaatta atcaattagc tgaaaagtat aatatgccaa tcttatattc ttgccatcct 540

agatc 545

<210> 554
<211> 250
<212> DNA
<213> Streptococcus pneumoniae

<400> 554
catatggtac atttgattta ttgcattatg gtcatatcaa tcttttgaaa cgtgctaaac 60
agctaggtga ttatttgatt gtagttgttt caagtgatga gtttaattta aaagaaaaga 120
ataaagtatg ttactttaac tacgaacaca gaaaaaattt agtagaagct attcgatatg 180
tcgatttagt aatccctgaa actagttggg aacagaaaaa gtcagatgtt aaagactacc 240
atattgacac 250

<210> 555
<211> 283
<212> DNA
<213> Streptococcus pneumoniae

<400> 555
ctcctagtgc cctatatctt tgaatttcct gcggatgatg ccctgcgtct caaggaaaga 60
atgcctctct tagaggaagt gggcgtcttt ctagcagagt acggagaaaa tcaatttatt 120
ctacgtgaac atcctatttg gatggcagaa gaagagattg aatcaggcat ctatgagatg 180
tgcgacatgc tccttttgac caaggaagtt tctatcaaga aataccgagc agagctggct 240
atcatgatgt cttgcaagcg atctatcaag gccaatcatc gta 283

<210> 556
<211> 284
<212> DNA
<213> Streptococcus pneumoniae

<400> 556
cttggtgcac agagtcctca aaaatcaatt tcagaacaaa cagcttatga aattgatgaa 60
gaggttcggt cattattaaa tgaggcacga aataaagctg ctgaaattat tcagtcaaatt 120
cgtgaaactc acaagttaat tgcagaagca ttattgaaat acgaaacatt ggatagtaca 180
caaattaaag ctcttttacga aacaggaaag atgcctgaag cagtagaaga ggaatctcat 240
gcactatcct atgatgaagt aaagtcaaaa atgaatgacg aaaa 284

<210> 557
<211> 627

<212> DNA

<213> Streptococcus pneumoniae

<400> 557

aagtaggcga tggttatgtc tttagaggaga atggagtttc tcgttatatc ccagccaagg 60
atcttttcagc agaaacagca gcaggcattg atagcaaact ggccaagcag gaaagtttat 120
ctcataagct aggaactaag aaaactgacc tcccatctag tgatcgagaa ttttacaata 180
aggcttatga cttagtagca agaattcacc aagatttact tgataataaa ggtcgacaag 240
ttgattttga ggctttggat aacctgttgg aacgactcaa ggatgtctca agtgataaag 300
tcaagttagt ggaagatatt cttagccttct tagctccgat tcgtcatcca gaacgtttag 360
gaaaaccaa tgcgcaaatt acctacactg atgatgagat tcaagtagcc aagttggcag 420
gcaagtacac agcagaagac gggtatatct ttgatcctcg tgatataacc agtgatgagg 480
gggatgccta tgtaactcca catatgaccc atagccactg gattaataaaa gatagtttgt 540
ctgaagctga gagagcggca gccaggett atgctaaaga gaaaggtttg acccctcctt 600
cgacagacca tcaggattca ggaaata 627

<210> 558

<211> 784

<212> DNA

<213> Streptococcus pneumoniae

<400> 558

gcattctctcg ttatgtcttt gcgaaagatt taccatctga aactgttaaa aatcttgaaa 60
gcaagttatc aaaacaagag agtgtttcac acactttaac tgctaaaaaa gaaaatgttg 120
ctcctcgtga ccaagaattt tatgataaag catataatct gttaactgag gtcataaag 180
ccttgtttga aaataagggt cgtaattctg atttccaagc cttagacaaa ttattagaac 240
gcttgaatga tgaatcgact aataaagaaa aattggtaga tgattttattg gcattcctag 300
caccaattac ccatccagag cgacttggca aaccaaattc tcaaattgag tatactgaag 360
acgaagttcg tattgctcaa ttagctgata agtatacaac gtcagatggg tacatTTTTG 420
atgaacatga tataatcagt gatgaaggag atgcatatgt aacgcctcat atgggccata 480
gtcactggat tggaaaagat agcctttctg ataaggaaaa agttgcagct caagcctata 540
ctaaagaaaa aggtatccta cctccatctc cagacgcaga tgtaaagca aatccaactg 600
gagatagtgc agcagctatt tacaatcgtg tgaaagggga aaaacgaatt ccaactcgttc 660
gacttccata tatggttgag catacagttg aggttaaaaa cggtaatTTG attattcctc 720

ataaggatca ttaccataat attaaatttg cttggtttga tgatcacaca tacaaagctc 780
caaa 784

<210> 559
<211> 502
<212> DNA
<213> Streptococcus pneumoniae

<400> 559
gaccattacc actttattcc ttacagcaag ctttctgcct tagaagaaaa gattgccaga 60
atggtgecta tcagtgaac tggttctaca gtttctacaa atgcaaaacc taatgaagta 120
gtgtctagtc taggcagtct ttcaagcaat ctttcttctt taacgacaag taaggagctc 180
tcttcagcat ctgatggta tatttttaat ccaaaagata tcgttgaaga aacggctaca 240
gcttatattg taagacatgg tgatcatttc cattacattc caaaatcaaa tcaaattggg 300
caaccgactc ttccaaacaa tagtctagca acaccttctc catctcttcc aatcaatcca 360
ggaacttcac atgagaaaca tgaagaagat ggatacggat ttgatgctaa tcgtattatc 420
gctgaagatg aatcagggtt tgatcatgagt cacggagacc acaatcatta tttcttcaag 480
aaggacttga cagaagagca aa 502

<210> 560
<211> 462
<212> DNA
<213> Streptococcus pneumoniae

<400> 560
tttcatttct tatttctctc aaaatactct cgggaaacata gcaggcaata tcctgaccaa 60
acttcaaaag ctctctaacg cctgatgaac tgatatagag atgttcagggt cgactatgta 120
aataaatagt ctctatatca gaagacagct gatgattgta gtaatcaaaa ctggcttcat 180
attgcaaate cgacgcattc ctcaaaccac gcactagaca agtagcacc aatctttttg 240
caacatcgac caccaattca tcatgagaag ccacgacttc aacattttcc agatgtccca 300
aagccttttc tagccccgt ttacgatttt cgataggaag aaatccttgt ttgtggggat 360
taaaaaaat acccacataa agcttatcaa aaagtctgct cgcccggttca atgatatcca 420
gatgccatt tgatcatgga tcaaatgagc ctgtgaataa gc 462

<210> 561
<211> 508

<212> DNA
<213> Streptococcus pneumoniae

<400> 561
gatttctgta tgaggcagtt cgcgattgac tgcaaattta tcattgtttt cacagagtga 60
accaaccaca tctaccgctt cagctgggcc atctggatgg gtcacgttgc taatatgatg 120
gtaagctccg tacatagctg gacgcatgag gttgactgct gaggcattcca cacctagata 180
ggtacggtag gtttccttct tatgagtgc tcttggtgact agagcaccgt gaggtgccag 240
cataaaacga cccaattcgg tgaaaatctt gacctgacca agacctgctg acgtaagaac 300
ttcttcatac accttacgaa ctccctcacc aatcaaggcg atatcggttc gtccttggtc 360
tggacgataa ttaacaccaa taccgccaga aagattgata aagtctagcc aaatgcccaa 420
cttttccttg atttcaacag ccagttcaaa gagctgacga gccaaactctg gataatagag 480
atgggtcacg gtattggacg ctaggaag 508

<210> 562
<211> 652
<212> DNA
<213> Streptococcus pneumoniae

<400> 562
ggctgttagt ccaagtcaag aactatcttg aaagatcaaa gtaaaggaag ttcgttattt 60
gaaggaattt agaaatttaa attctaagga tgcaaggga tatgacttgg ctttattaat 120
tctagaaaag ccatttggtg caaaattagg gactttgggt cttcctacta gtcaaaaaaa 180
tttgacagga ataactgtga ctatcacagg ctatccatca tataatttta aaattcatca 240
aatgtatata gataaaaaac aagttttaag tgatgatggc atgttcttgg attaccaagt 300
tgatacttta gaggggtcta gtggatctac agtttatagt gctagtcacc gtgtagtagg 360
agtgcatact ttaggagatg gagctaata aattaacagt gcagttaaat taaatgaagc 420
aaattgccat ttacttattt attcggttct taaagggtac tctcttgaag gatggaagaa 480
aataaatggg agttggtact attatagaca acatgataaa caaacgggtt ggcaggagat 540
aaatgatact tggattatt tagacagttc cggttaagatg cttacagatt ggcaaaaagt 600
aaatggaaac tggattatc tcaattcaaa tggagcaatg gttacaggta gc 652

<210> 563
<211> 250
<212> DNA
<213> Streptococcus pneumoniae

<400> 563
cttgtgctgt tcttcgttga tttccttgat atccaaaaga accaagtcag tgacagccat 60
gagtttgtca aacttctcaa ggtaacgcgg tttattacgg aaaggaagag cacagggtgtc 120
caagggtacag tggattcctt gttccttagc cttggtgaag agagcaatca ggaaatcaat 180
ctgcaagaga gcttctcttc cactgactgt aatcccaccc ttatttcccc agaaaccacg 240
gtagcgcaag 250

<210> 564
<211> 500
<212> DNA
<213> Streptococcus pneumoniae

<400> 564
ttgatatcca acaactacaa aaagacgaag taaacaatat tacatatattt gctgaaaatg 60
ctgctggcga agactgggat ttatcagata atgtcgggtg ggggccagac ttgccgatc 120
catcaacctt ccttgatata atcaaaccat ctgtaggaga aagtactaaa acatatattag 180
ggtttgactc aggggaagat aatgtagctg ctaaaaaagt aggtctatat gactacgaaa 240
aattgggttac tgaggctggg gatgaggcta cagatgttgc taaacgctat gataaatacg 300
ctgcagccca agcttggttg acagatagtg ctttgattat tccaactaca tctcgtacag 360
ggcgtccaat cttgtctaag atggtaccat ttacaatacc atttgcattg tcaggaaata 420
aaggtacaag tgaaccaatc ttatataaat acttgggaact tcaagacaag gcagtcactg 480
tagatgaata ccaaaaagct 500

<210> 565
<211> 525
<212> DNA
<213> Streptococcus pneumoniae

<400> 565
aggaaacaga aaataaagag aaacataaag atattcataa tgctatagaa acttcaaagg 60
atactgaaga aaagaaaaca acaattattg aggaaaaaga agttgttagt aaaaatcctg 120
taatagacac taaaactagc aatgaagaag caaaaatcaa agaagaaaat tccaatcaat 180
cccaaggaga tcatacggac tcatttgtga ataaaaacac agaaaatccc aaaaagaag 240
ataaagttgt ctatattgct gaatttaaag ataaagaatc tggagaaaaa gcaatcaagg 300
gactatcaaa tcttaagaat acaaaagttt tatatactta tgatagaatt tttaacggta 360

gtgccataga aacaactccg gataacttgg acaaaattaa acaaatagaa ggtatttcat 420
cgattgaaag ggcacaaaaa gtccaacca tgatgaatca tgccagaaag gaaattggag 480
ttgaggaagc tattgattac ctaaagtcta tcaatgctcc gtttg 525

<210> 566
<211> 250
<212> DNA
<213> Streptococcus pneumoniae

<400> 566
cattgaaacc aggagaaaag gtagcagaag ctaagaagaa ggttgaagaa gctaagaaaa 60
aagccgagga tcaaaaagaa gaagatcgtc gtaactaccc aaccaatact taaaaacgc 120
ttgaacttga aattgctgag ttcgatgtga aagttaaaga agcggagctt gaactagtaa 180
aagaggaagc taaagaatct cgaaacgagg gcacaattaa gcaagcaaaa gagaaagttg 240
agagtaaaaa 250

<210> 567
<211> 280
<212> DNA
<213> Streptococcus pneumoniae

<400> 567
aaaagcgaaa gttaagagtg aacaagctga ggctacaagg ttaaaaaaaaa tcaagacaga 60
tcgtgaacaa gctgaggcta caaggtaga aaacatcaag acagatcgtg aaaaagcaga 120
agaagctaaa cgaaaagcag aagcagaaga agttaaagat aaactaaaga ggcggacaaa 180
acgagcagtt cctggagagc cagcaacacc tgataaaaaa gaaaatgatg cgaagtcttc 240
agattctagc gtaggtgaag aaactcttcc aagcccatcc 280

<210> 568
<211> 414
<212> DNA
<213> Streptococcus pneumoniae

<400> 568
aagatattgc caacctcaac atcgatggct tggttcttga catcaatatt agttaccttc 60
aagagtgact tgtagtcaaa ctgcttttca cgttcttctt gggcattgtc cgcaaagacc 120
gctacacctg ccagttctga gtcgaactcg cgcaagagac taatcatacc gttgaccgtt 180
ccgccacctt tcaagaagtc atccacaatc aagacacggc tgcttgcctt aagactacgt 240
tttgaaagga acattttctc gatacgggtca ccacttgaac ctgaaacata gttgacgcta 300

acagttgaac cttcggtaat tttcaggtca cggcgcacaa tgacaaaaga gacattgagg 360
acattggcaa ctgcatttgc aagtggcaca cccttagttg ctacgggtcat aacc 414

<210> 569
<211> 312
<212> DNA
<213> Streptococcus pneumoniae

<400> 569
gcttgtatga cgatagagga gttagaagag gtcaaaaact cagcggcagg aacctttggt 60
actaagacag cgaccttgga cttccgtcag gggaaatcctg agccacgcta ccaagatggt 120
ccacttggtt ccatcaactc tatgggcttg ccaaataatg gcttagacta ttatttggat 180
tatcttttgg atttgcagga aaaagagtcg aaccgaactt tcttcttata tctggtcggc 240
atgtctccag aggaaacca tactattttg aaaaaagtcc aagagagtga ttttcgtggt 300
ctgactgagc ta 312

<210> 570
<211> 599
<212> DNA
<213> Streptococcus pneumoniae

<400> 570
ttgtagggct aggaacaggt tctactgcct attattttgt cgaagaaatc ggtcgtcgaa 60
tcaaggaaga aggcttgcaag attacagctg tgacgacttc tagtgtgacc agtaaacagg 120
ctgaagggct caatatcccg ctcaagtcta ttgaccaagt agactttgtc gatgtgacag 180
tcgacggggc ggatgaagtg gatagtcagt ttaatggaat caaaggcggg ggtgggtgccc 240
ttctcatgga aaaggtggtc gcaacaccat caaaagaata catttgggtg gtggatgaaa 300
gcaagctggt cgaaaaacta ggtgctttta aattgccagt agaagtgggt cagtatgggtg 360
cagagcaggt ctttcgtcat tttgaacgag ctggctacaa accaagtttc cgtgaaaaag 420
acggccaacg ttttgtgacc gatatgcaga attttatcat tgacctcgcc ttggatgtca 480
ttgaaaatcc aattgctttt ggacaagaat tggaccatgt cgttgggtgt gtggagcatg 540
gtttattcaa ccaaaggtg gataaggtaa tcgttgctgg acgagatgga gttcagatt 599

<210> 571
<211> 450
<212> DNA
<213> Streptococcus pneumoniae

<400> 571
atgacgcgct atgctttgct ggtgagaggt atcaatggtg gtggttaagaa taaggtcgtc 60
atggcggagc ttcgtcaaga attgacaaac ttgggactgg aaaagggtga gagctacatc 120
aatagtggca atattttctt tacttcgata gattccaaag cccaattggt tgaaaagcta 180
gagactttct ttgcagtcca ttatccattt attcagagct tttctttact gagtctagag 240
gactttgagg cggaacttga aaatctacca gcttggtgga gcagagactt ggcacgaaaa 300
gattttctct ttacactga gggtttggat gtggaccaag tcatcgcgac agttgaaagt 360
ttagagctga aagatgaagt gctttatttt ggaaaacttg ggattttctg ggggaaattt 420
tctgaagaat cctattctaa gactgcctat 450

<210> 572
<211> 527
<212> DNA
<213> Streptococcus pneumoniae

<400> 572
aaccatgtat tgaggaaagt gacaactttc agtgctccta aagtgattac ttccagaact 60
gtttggaatg ctaagaatgg tttctgggat gttggtttgg aaagtcgtaa attagctggt 120
agtggaaaaa ttaagcatta tgtggttgat aatgacaatg ttgtgactcc cttgattcat 180
aataatcgtg atattgttac atttacaggt aattcacgct ttaaaccaccg ttctcgtggc 240
tattttgaaa gtccaatgaa tgatattcct aactttaata ttggtaaaca agctaccttg 300
gataaacatg gttatcgtga tccgaaattg gataaagtgc gattctttaa gaaacaggct 360
ctgcctcgat cttctagtca accaagcgt gaaccaatgg aaaatattgc ctcaggaaaa 420
caggttactc aaagttcgac agctttcgga ggagatgcta gaagagctgt ggatggcaaa 480
gtcgatggta actatggtca caattctgtc actcatacaa acttcca 527

<210> 573
<211> 561
<212> DNA
<213> Streptococcus pneumoniae

<400> 573
ggacttcctt ttcttatcca gaaattgatc tagctctctc tgatttcgaa gaatagtgac 60
tttatgtgaa tattcttggc aaagtttttg gtaattttct ttttgagttt tgctacgccc 120
atcccaaaga atccatctga taaactccca ctcaaagcgt tcagggcaat ctaccgcat 180

actttctctg acttttccac ggtatttaag ataacgctta aaggctctaa agagacaggt 240
 caatggcgaa aaattgagaa agatgatttg gtcagcttct tgcattcggt cttggtagta 300
 gcaccaagaa taattaccat cgatgacca agctttatgc ttggtgagaa agttttttat 360
 ctcggttaac atccattcgc agtcactgtc ttgccaacca gggtgaaatt ggagtgtgtc 420
 catgtgcagt tttggaatgg agtagtagtt agataacttt tctgctatag ttgacttacc 480
 agaaccagaa tatccgataa ttgcgatttt cattttctac cttttcctat ttggagacaa 540
 aaaaacagcc tctatggact g 561

<210> 574
 <211> 503
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 574
 tttgcagatt tgtgagattg atactgatcc agacctgatg ggcaaaggac tccacttccc 60
 caatcggcat ctgagtaaaa cgataatagt agctatcagg gtcgttttgg gctagactca 120
 gcattttcaa gaaacgggtc agataccaac tttcaatatc atccactcca gcactacat 180
 agatggaaaa gtcaaagaag tcagtgatat agagacgatc gttttgtgga ttttgaaaga 240
 cattgattcc ctcaacaatt acaaaatcag cagctttgac actttgtttc tcttcgggta 300
 cgatgtcgta aacttcatga gaatagacag gaatatctac atcttgtcca tttttgatgc 360
 ggtccaagaa gttgagaaga gcttccatat catagctttc aggaaatcct ttacgattta 420
 aaatcccctg ctcaatcaag gtttgattgg gatagagaaa accatcagtt gtaaccaact 480
 caaccgtagc atctgtaaac gta 503

<210> 575
 <211> 501
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 575
 aatagcagta gcagggacag gttatgtggg tttatctatt gcaattctat tagcgcaata 60
 tcataagggt atagcggtag atgttattcc tgaaaaagta gagcttatca atcgtcgcca 120
 atctcccatt aaggatgatg atattgaaac ttatttagtg gaaaaggaat tagacttagt 180
 tgcaacatta gatggtaatg aagcttatcg agatgctgac tttgtcataa ttgctgtccc 240
 aactaactat gacagtaaaa aaaattatth tgatacatct gttgtggaag cagttattga 300

gcagattatt gcggttaatt tgaaggcaac aattgtcata aaatccacaa ttcctgtggg 360
atatacagaa agtctccgaa cacgttttgg gcaatttaag attctcttta gtcctgaatt 420
tttacgggag tctaaagcac tttatgataa tctctatcct agtcgaatca tcgttggagc 480
agatttgaga gatacggagc a 501

<210> 576
<211> 200
<212> DNA
<213> Streptococcus pneumoniae

<400> 576
atgaatttaa catttttagg cttatgtatt gcctgtatgg gcgtatctgt cgggtgaaggt 60
ttattgatga atggactgtt taaatcagta gcacgccaac cagatatgct ttctgagttt 120
cgtagtttga tgttttttagg tgttaccttt attgaaggaa ctttctttgt aactcttgtc 180
ttctcattta ttatcaaata 200

<210> 577
<211> 300
<212> DNA
<213> Streptococcus pneumoniae

<400> 577
atgagtgaat taggctttta atacagtatt ttagcgtcgg gttccagtgg aaattctttt 60
tatctggaaa cctcaaaaaa gaagctttta gtagatgcag gcttgtctgg caagaaaatt 120
accagtctgc tagctgaaat taaccgtaag ccagaagacc tggatgccat cttgattacc 180
catgagcatt cagatcatat ccatggagta ggcgttttgg ctgcgaagta tggatatggat 240
ctttatgcca atgaaaagac ctggcaagct atggaaaata gtaaatatct tggcaagggtg 300

<210> 578
<211> 550
<212> DNA
<213> Streptococcus pneumoniae

<400> 578
ttgcacttta tatcctccat tattttgtct tttatatcag tgattatgga caggatttct 60
ttaaaagggg atatttgatt gaacttgtcc agacattgaa atatatacta ttctttgcac 120
tagcgattag tatttctaata tttttcttag aggatcgatt tagtatttcc agacgaggca 180
tgatttactt cctcacatta catgctctct tagtctatgt gctaaaccta tttatcaagt 240
ggatttgga gcgggcttat cccaacttta aaggaagtaa gaagattctc ctacttacag 300

caacttctcg tgtcgaaaag gtactggata gattaataga atcaaagtag gttgttgggg 360
 agttggtagc cgtcagtgtc ttagataaac cagattttca gcatgattgt ttaaaggtag 420
 tagcagaggg ggagatagta aactttgcga ctcatgaggt ggtcgatgaa gtctttatca 480
 atcttccaag taaaaaatac aatattggag agcttgtctc tcagtttgaa acgatgggaa 540
 ttgatgtaac 550

<210> 579
 <211> 345
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 579
 aagtaggggc tttcttgcca aaaacatctt tggatgaact accacaattg tttaatattc 60
 ttgttggtaa tatgagtatt gtaggtccta gaccagcggg tataaatgaa ctagatttga 120
 ttgcagagag agataagtat ggagcaaagc atatcttgcc agggttaact ggatgggcac 180
 aaattaacgg gcgtgatact ttgtctgttg agatgaagac ggagttagat ggctactatg 240
 ttaaacaatc gtctttgata atggatatta gatgtatagt taagacaata ccttacgtac 300
 tgaaacgaaa aggtattgta gagggtagtg gtaagaaaga aagtt 345

<210> 580
 <211> 600
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 580
 taacgagatt attacaaaac aaaactacta tcgtatttct ttttctggta aaggaaaatt 60
 aagtaagata ttaggttatg taaaattcag aaaagaaatt aaaaagaagc taaaagaaaa 120
 tgattatgat atgatattgc cgttacatag tattgtgtct ttcatttttag tagattttct 180
 tctcttttca tttaaaaata gatataattt tgatattcgt gattacagtt atgaaaaatt 240
 tttggtttat cgtttggttc agaaacaatt ggtgaaaaat tctttaatga atctcgtttc 300
 ttcagacggc tataaatttt ttttaccat gggagagtat ttactaccc ataacctacc 360
 caatatgata gaattaaacg aggtaaagca gttaaaaaat aatagtagct ttccaattca 420
 actttcctac attggtttaa ttcgttttca agaacaaaat aaaaaataa tcgatttttt 480
 tgcaaatgac agtcgatttc agttgaattt tataggtact aatgcaggag aattaaggga 540
 attttgtcaa gaaaaaata tcagcaatgt taacttgggtg gacacattcc agcctaaaga 600

<210> 581
<211> 561
<212> DNA
<213> Streptococcus pneumoniae

<400> 581
gaaagaattg ggtgcaaagg tttatcatgt gcctctatta aggaaaaagc ctctacatca 60
gtttctctct cttgctagaa taataaagaa aggagattat gatatagttc attgccatgg 120
ctataaatct gcaattggtc tgatcttata taaaataatt gggtgtaaaa ttagaattat 180
tcatagtcac atggcttatg taacagaaaa cagttttcaa aaagtattgc gtaaattagt 240
aacaattttg gtaaaaatct tagcaactca ttggtttgca tgtggggaag attcggctaa 300
gtggttatat ggagagaaaag cgtataaaga cggaaaaatt gaaattatct ttaatgcaat 360
tgatttgaaa aagtatcaat ttttgtcaga tgtagagaa aaatgtcgta gagaattaga 420
tgtgtcaa at aagttcgtat taggaaatat agctcgcta tcagatcaaa aaaaccaaag 480
ttatttatct aacgttttaa aagaactcat tttaatcaaa ccaaattgta ttttactcct 540
agttggta at ggtgaggatg a 561

<210> 582
<211> 736
<212> DNA
<213> Streptococcus pneumoniae

<400> 582
gcttccatca aatcacttta cactactaat tcagatttgg atttaaattt atggattatt 60
gctgataaag tttcggatag aaataaagaa aagataaata gattatcaaa acaatttgcg 120
cagagagaaa ttaattggat agagaacgtt gagatcccat ttaaattaca ttagatagg 180
ggatcaatta gttcatttag cagattatct ctgggaagtg ttcttccatc ttcaatgagt 240
aaagttcttt atcttgacag tgatattatt gttatggatt ctttacgaag tatttttgat 300
attgatttta agggtaaaat tctctatggg gtgaatgata cttttaataa agaatacaag 360
caggtgttgg gtataccaat tgacaagcca atgtttaatg ctggagttat gcttattaat 420
ttagagttat ggagaaataa taacgtcgaa gaaagatttt tgcaagtaat tcaaaagttt 480
aatggtacta tattacaagg agatttaggg gttttaaatg cagttttata taactcattt 540
ggtgtacttc ctccagaata taattatatg accatatttg aagatttgac ttatgaagaa 600
atgatagttt ttaaaaaacc aattaattat tattcaaaag aggaaattaa aaatgccaga 660

gaacgtatag tcttacgaca tttcacaact agttttttat caaaaagacc ttggcaagaa 720
ggcagtaatg ttgcac 736

<210> 583
<211> 525
<212> DNA
<213> Streptococcus pneumoniae

<400> 583
tggaagacct ttatcctgtc ttttaacagt tcctttcgtg aaaacaaata ttactcccaa 60
tcaaatatct tatttatcta taattccttt gattggttga ttataataa tgatatttac 120
aactgatttc gttgtattat tactggcatg gtttctattt tttttatgga acttactaga 180
tgagtagat gggaacttag ccagatatcg ggagcaatac tcgaaggatg gaagtgtagt 240
agatgcaatg gctggctatg tagccatggt gttgacgtat ttcggtgcag gaatagtagc 300
tgctcattta aacgactcag atatctatat aattttgggt gcattatctg ggatttcatt 360
gatttttcca aggttagtga tgcataagta tatcaataga gtagctcaag atgagtctgt 420
gagtagcatt aaagataaat ctgattttta tactataaaa atactggctc taaacatgac 480
atcaattaca ggaattccgc aggttttact gctattaact atttt 525

<210> 584
<211> 596
<212> DNA
<213> Streptococcus pneumoniae

<400> 584
ctataatggt gagcgatatt tgtcacaaca gattgatagt attaggtctc aaacattcac 60
taattggacg ctttttatta gggatgatgg atcaaaagat aaaacaatag aagtaataga 120
gaggtattct aagatagatg atagaattag attcgttgaa aatccctcaa agtttcatgg 180
agcttattac aattttttta atctaattga atacgttaaa aacaattatc aatttgatta 240
ttactttttt tgtgatcaag atgatatttg gaaagagcac aagttagaaa tacagctgtt 300
aagattttct aaagatgaca tgccagagat ggtttactct gatatgtcaa cgattgatgc 360
cagtaataat ttgatagata ttagtataaa taaaataatg gggattgaat taccgaacat 420
aaataatttg tattttattc atgcctatat ctgggggtgt actgcagggt ttaatcatgc 480
attgctagag atggttcctt cagttgatat tgataaagat tatttatata tagaaaaact 540
gtctcatgat aattattttg caaagtttgc actagagtat gggaagggtg tgttct 596

<210> 585
<211> 530
<212> DNA
<213> Streptococcus pneumoniae

<400> 585
cgtatcaagt cggcattttc aaactttggg tatgcaaaat aatttttggc tggcagagaa 60
tgttgaattt ctggaatttg gattacctcg aaatgatgat ttttttaaaa gtgaaaaaat 120
caaaaccaca aatataaaat ttagaacatt atttgatata gatttagacg aactggtagt 180
tttgtatatg ccgacgttca gagatgatgg atcgttgaat gcctataatt tagattactc 240
gaaactaata catgtttttc aaaataaatt tagaaaaaat gtaaaaatat tagttcgttt 300
tcatccaaat gttgattcta gttttataaa tttacaggat acagactgta taaatgtgtc 360
gacctattca aatcctcagg atctgatgat gagtgcagat gtgatgatta cggattattc 420
atcggcttct attgatttta tgttattaaa tcgtccagta tttctgtatt taccagatta 480
tcaaagttat gtgaatgata gaccattgga tgataacttt gataaattgc 530

<210> 586
<211> 380
<212> DNA
<213> Streptococcus pneumoniae

<400> 586
ggatatgcca gcaaaaacgt tagccagcaa agttcaagtg gctgtaccag ctgacactcg 60
tatcgtctca atctctgtca aggataaaca gccagaggaa gccagtcgta tcgctaattc 120
tctacgagaa gttgctgcag aaaagatcgt cgctgtaacg cgagtatctg atgtaacgac 180
acttgaagaa gcgcgaccag ctacgactcc ctcttctcca aatgttcgac gcaattcctt 240
gtttgggtttt cttggaggag cagtcgtaac agtaattgct gttcttttga ttgagttgct 300
cgacaccgct gtgaaacgct ctgaagatat tgaagatgta ctgaaaattc cacttttagg 360
gctcgttcca gatattgaca 380

<210> 587
<211> 290
<212> DNA
<213> Streptococcus pneumoniae

<400> 587
atcaacgact tccaccaata tcgcttgggc ttttgcgcgct gcaggttaca aaacgttgct 60

gattgatgga gatattcgca attctgttat gttaggtgtc tttaaagcaa gggataagat 120
tacaggcctg acagaatttt tatcaggaac tacagaccta tcacaagggc tttgtgatac 180
caatatcgaa aatctctttg taattcaggc tggctctgtg tcaccgaatc cgacagctct 240
tcttcaaagt aagaatttca gtacaatgct tgaaaccttg cgtaaataatt 290

<210> 588
<211> 507
<212> DNA
<213> Streptococcus pneumoniae

<400> 588
agattacact ttacagcta tctccctcag ctacttaacc agtattattg ttgccttttag 60
gcaggaggga cttagtcaat ttatcttgat actaacagat gatagtttca atgggttcggt 120
actagaaatg catgaagttg cacctattac agctctcttt attctgtact atttgtacaa 180
atattttata aaagaaaata gtttttcttc agtattttat aatatcttaa tagctctcat 240
tattcttttt ttaagcctta aacgaatcgt tcttttgagt gtattaatta tcataccagt 300
atttttggta atttattggt atgataaaaa agtaagtaaa ctagggaaag aacgaaaaat 360
tttaagttta ttaaataatct tttccttaat atttataaca ggaatattcc tttatgttta 420
tagtgtaaaa tctgatttta tatatacatt tattcaagaa cataatatta attcgatggc 480
tagaacagat ttatggaagg gagttga 507

<210> 589
<211> 558
<212> DNA
<213> Streptococcus pneumoniae

<400> 589
tctggactct cgataattgg aataatgggt ttcttatatc taattatggt ccgtctatat 60
ttatatgggt ttgctttcta attatttttc aaattactgg ttttatttta caaaaagtta 120
gtatatatga tttttctgta tggatatctga ttttatctta tttttttatg tttggattaa 180
ttttcaatga gtatatgggg tttcaaacia ctctgctgtg gagccctagt aacttctata 240
ataatgaaga attatttcat tcatatatat ttataatttg gattttggtt tgttattctg 300
taggctattt atttttttat agtgatggaa aggtacatta tcattcagaa gtacaaaatt 360
atcaggaaaa tgaagagaaa attttgtaca atgcgggtag gattttaaca ggagtgggct 420
ttatttctag ggtaataact gattctaaaa cagtactagc agttagagcg gcgaatagct 480

attcagcata ttcagaggca gctagttcag gaataataga tgatttagga gtacttatgc 540
ttcctggtgt gttctcct 558

<210> 590
<211> 516
<212> DNA
<213> Streptococcus pneumoniae

<400> 590
acatttggtta tagtttcctt gttgacaaaa ttgtcgtaca ggcctaaagt ggaggggaatt 60
tcgcatgaag aattgaaaga aataaatcct tcaaagataa tctatgtcat tcttctgact 120
ctaaatcttg ttatggttatt tctttatatc cgtgaaattc agaaagtagt attgttttca 180
ggtagaagtt tttctaatat tacagatttg ataagtaact ataggtacct atcttattat 240
tcaaatgaag tagaaaatcg tgtaagtgga atgattaatc aactatctaa aattattcca 300
gcgactacac ttatttcttt atatatatat atgaataatt attttataac taaacaaata 360
aagaaaaatt tcattttattt gattccaata gctatattct ttgtctatgc aatcattagt 420
ggtggtagat tgccccttat aaggttagtt gttggagctc tgttgatatt gtatatatac 480
tctgtgtacg ggagtcctaa atctcaactt accaaa 516

<210> 591
<211> 383
<212> DNA
<213> Streptococcus pneumoniae

<400> 591
ttttaacca ccaagttgac tttagcttga tgcgagagat tggtaagggt tttgcggaaa 60
aatttgctgc tactggcatt accaaggctc taaccattga agcgtcgggt attgccccag 120
ccgtttttac agctgaagcc ttaaactgtc ccatgatatt cgccaaaaaa gctaagaaca 180
tcacatgaa cgaagacatc ttaactgtc aagtctactc ctttaccaag caggtgacca 240
gcaccgtttc tatcgctgga aaattcctct caccagagga caaggttttg attatcgacg 300
atttccttgc taatggccaa gctgctaaag gcttgattca aatcatcgaa caggccggtg 360
ccacagtcca agctatcggt atc 383

<210> 592
<211> 723
<212> DNA
<213> Streptococcus pneumoniae

<400> 592
gtggatgctc aagaaactgc gggagttcac tataaatatg tggcagattc agagctatca 60
tcagaagaaa agaagcagct tgtctatgat attccgacat acgtggagaa tgatgatgaa 120
acttattatc ttgtttataa gttaaattct caaaatcaac tggcgggaatt accaaatact 180
ggaagcaaga atgagaggca agccctagtt gctggtgcta gcttagctgc tctgggaatt 240
ttaatttttg ctgtttccaa gaaaaagggt aagaataaaa cggtattaca tttagtattg 300
gttgcgggaa taggaaatgg tgtcttagtt tcagtccatg ctttagaaaa tcactttttg 360
ctaaattaca atacggacta tgaattgacc tctggagaaa aattacctct tcctaaagag 420
atttcagggt acacttatat tggatatatc aaagagggaa aaacgacttc tgattttgaa 480
gtaagtaatc aagaaaaatc agcagccact cctacaaaac aacaaaagggt ggattataat 540
gttacaccaa attttgtaga ccatccatca acagtacaag ctattcagga acaaacacct 600
gtttcttcaa ctaagccgac agaagttcaa gtagttgaaa aacctttctc tactgaatta 660
atcaatccaa gaaaagaaga gaaacaatct tcagattctc aagaacaatt agccgaacat 720
aag 723

<210> 593
<211> 465
<212> DNA
<213> Streptococcus pneumoniae

<400> 593
attatcactg gcggaaagac ccataattag gttttttctc gcacattggt gggaacgggt 60
gcatcatgca ggtaggacct gttgataatg gtgcctggga cgttgggggc gggttggaatg 120
ctgagaccaa tgcagcgggt gaactgattg aaagccattc aactaaagaa gagttcatga 180
cggactaccg cctttatata gaactcttac gcaatctagc agatgaagca ggtttgccga 240
aaacgcttga tacagggagt ttagctggaa ttaaaacgca cgagtattgc acgaataacc 300
aaccaaacaa ccactcagac catgtggatc cataccctta cttggcaaaa tggggcatta 360
gccgtgagca gtttaagcat gatattgaga acggcttgac gattgaaaca ggctggcaga 420
agaatgacac tggctactgg tacgtacatt cagacggctc ttatc 465

<210> 594
<211> 452
<212> DNA
<213> Streptococcus pneumoniae

<400> 594
aatggaatga acggaagtga agctgctggt catgaagtgc cagaatacac aggcccatta 60
gggacatccg gcgaagagcc agctccaaca gtcgagaagc cagaatacac aggcccacta 120
gggacatccg gcgaagagcc agccccgaca gtcgagaagc cagaatacac aggcccacta 180
gggacagctg gtgaagaagc agctccaaca gtcgagaagc cagaatttac aggggggagtt 240
aatggtacag agccagctgt tcatgaaatc gcagagtata agggatctga ttcgcttgta 300
actcttacta caaaagaaga ttatacttac aaagctcctc ttgctcagca ggcacttcct 360
gaaacaggaa acaaggagag tgacctccta gcttcactag gactaacagc tttcttcctt 420
ggtctgttta cgctagggaa aaagagagaa ca 452

<210> 595
<211> 526
<212> DNA
<213> *Streptococcus pneumoniae*

<400> 595
ggtcaactgt ccatatctcc tatttttcaa ggaggttcat atcaactgaa caataagagt 60
atagatatca gctctttggt attagataaa ttgtctggag agagtcagac agtagtaatg 120
aaatttaaag cagataaacc aaactctctt caagctttgt ttggcctatc taatagtaaa 180
gcaggcttta aaaataatta cttttcaatt ttcattgagag attctgggtga gatagggtga 240
gaaataagag acgccaaga ggaataaat tatttatatt ctagaccagc ttcattatgg 300
ggaaagcata aaggacaggc agttgaaaat acactagtat ttgtatctga ttctaaagat 360
aaaacataca caatgtatgt taatggaata gaagtgttct ctgaaacagt tgatacattt 420
ttgccaatth caaatataaa tggatatagat aaggcaacac taggagctgt taatcgtgaa 480
ggtaaggaac attacctcgc aaaaggaagt attggtgaaa tcagtc 526

<210> 596
<211> 506
<212> DNA
<213> *Streptococcus pneumoniae*

<400> 596
agtcgcacta gccacatttt tcttcgggttt gctagggacc agtacagtat ttgcagatga 60
ttctgaagga tggcagtttg tccaagaaaa tggtagaacc tactacaaaa agggggctct 120
aaaagaaacc tactggagag tgatagatgg gaagtactat tattttgatc ctttatccgg 180
agagatgggt gtcggctggc aatatatacc tgctccacac aaggggggta cgatcgggtc 240

ctctccaaga atagagattg ctcttagacc agattgggtt tattttggtc aagatgggtg 300
cttacaagaa tttgttggca agcaagtttt agaagcaaaa actgctacga ataccaacaa 360
acatcatggg gaagaatatg atagccaagc agagaaacga gtctattatt ttgaagatca 420
gcgtagttat catactttaa aaactgggtg gatttatgaa gagggttatt ggtattatth 480
acagaaggat ggtggctttg attctc 506

<210> 597
<211> 518
<212> DNA
<213> Streptococcus pneumoniae

<400> 597
atttcgagtg ttgcttatgg gcgccaagtc tatctcaagt tggaaaccac gagtaagagt 60
gatgaagtag aggctgcttt tgaagctttg ataaaaggag tcaaggtagc tcctcagaca 120
gagtggaaagc agatttttga caatacagaa gtgaaggcgg ttatttttagg gggcgaccca 180
agttcgggtg cccgagttgt aacaggcaag gtggatatgg tagaggactt gattcaagaa 240
ggcagtcgct ttacagcaga tcatccaggc ttgccgattt cctatacaac ttctttttta 300
cgtgacaatg tagttgagac ctttcaaaac agtacagact atgttgagac taagggttaca 360
gcttacagaa acggagattt actgctggat catagtgggt cctatgttgc ccaatattat 420
attacttggg atgaattatc ctatgatcat caaggtaagg aagtcttgac tcctaaggct 480
tgggacagaa atgggcagga ttgacggct cactttac 518

<210> 598
<211> 534
<212> DNA
<213> Streptococcus pneumoniae

<400> 598
gggtaactat gcgacttctg cttcaagttc ttcattgggat ttagtagcaa ataactatct 60
gaaaatgacc gacactggaa atgtaacacg aactgcagca catgaagatg cgatagcggt 120
cgcttctgct aaaaatcaaa cagttgagtt tgataaagtt aacatagggt gagaaagttt 180
taaatacaga aatatagggg cttttttcga taagagtaaa atcacaacaa atgaagatgg 240
aacaaaagct cctagtaaat taaaatttgt atatataggc aaggggcaag accaagattt 300
gataggtttg gatcttaggg gcaaaattgc agtaatggat agaatttata caaaggattt 360
aaaaaatgct tttaaaaaag ctatggataa ggggtgcacgc gccattatgg ttgtaaatac 420

tgtaaattac tacaatagag ataattggac agagcttcca gctatgggat atgaagcgga 480
tgaaggtact aaaagtcaag tgttttcaat ttcaggagat gatggtgtaa agct 534

<210> 599
<211> 604
<212> DNA
<213> Streptococcus pneumoniae

<400> 599
gatcaacaag ctgaagaaga ctatgctcgt agatcagaag aagaatataa tcgcttgact 60
caacagcaac cgccaaaagc tgaaaaacca gctcctgcac caaaaacagg ctggaaacaa 120
gaaaacggta tgtggtactt ctacaatact gatgggtcaa tggcgacagg atggctccaa 180
aacaacgggt catggtacta cctcaacagc aatggtgcta tggctacagg ttggctccaa 240
tacaatgggt catggtatta cctcaacgct aacggcgcta tggcaacagg ttgggctaaa 300
gtcaacgggt catggtacta cctcaacgct aatggtgcta tggctacagg ttggctccaa 360
tacaacgggt catggtatta cctcaacgct aacggcgcta tggcaacagg ttgggctaaa 420
gtcaacgggt catggtacta cctcaacgct aatggtgcta tggctacagg ttggctccaa 480
tacaacgggt catggtacta cctcaacgct aacgggtgcta tggctacagg ttgggctaaa 540
gtcaacgggt catggtacta cctcaacgct aatggtgcta tggcaacagg ttgggtgaaa 600
gatg 604

<210> 600
<211> 500
<212> DNA
<213> Streptococcus pneumoniae

<400> 600
gtgtcagcac aaattacgat taaccataaa aaagcgcgct atgttcggat tgagctagaa 60
ggctataatg ccctcagtct tgcagaagtt gaagttttct gctttatagc tacgaatgct 120
gaaacggcga cacaagtttc taagccagtt caaccaatca gtcagactcc tgtgaaggat 180
aaaacattga caattcaaca cagtggagct tacattgccc gctactccat aacttgggaa 240
gaagttccag tagataaaga tggaaaccaa gttgttcgta gtcattcttg ggaaggaagc 300
ggtcgcaacc agactgcagg ttttgtcctc aacctcccaa tcaaagaaaa tatgagaaat 360
ctgcgagtta agattgagaa aaagacgggc ctactatgga atagatggca aacaatctat 420
gaaaacagac caatttttagc tcaacccac cgtaaaatta cccattgggg tacgacattg 480

aattccaagg tgagtgcga

500

<210> 601
<211> 419
<212> DNA
<213> Streptococcus pneumoniae

<400> 601
tggttcggatt gagctagaag gctataatgc cctcagtcctt gcagaagttg aagttttctg 60
ctttatagct acgaatgctg aaacggcgac acaagtttct aagccagttc aaccaatcag 120
tcagactcct gtgaaggata aaacattgac aattcaacac agtggagctt acattgcccg 180
ctactccata acttggaag aagttccagt agataaagat ggaaaccaag ttgttcgtag 240
tcattcttgg gaaggaagcg gtcgcaacca gactgcaggt tttgtcctca acctcccaat 300
caaagaaaat atgagaaatc tgcgagttaa gattgagaaa aagacgggcc tactatggaa 360
tagatggcaa acaatctatg aaaacagacc aatttttagct caaccccacc gtaaaatta 419

<210> 602
<211> 401
<212> DNA
<213> Streptococcus pneumoniae

<400> 602
atctgtagaa ggtcttggtt tcgcaattcc tgcaaatgat gctatcaata ttattgaaca 60
gtagaaaaa aacggaaaag tgacgcgtcc agctttggga atccagatgg ttaatttatc 120
taatgtgagt acaagcgaca tcagaagact caatattcca agtaatgtta catctggtgt 180
aattgttcgt tcggtacaaa gtaatatgcc tgccaatggc caccttgaaa aatacgatgt 240
aattacaaaa gtagatgaca aagagattgc ttcattcaaca gacttacaaa gtgctcttta 300
caaccattct atcgagaca ccattaagat aacctactat cgtaacggga aagaagaaac 360
tacctctatc aaacttaaca agagttcagg tgatttagaa t 401

<210> 603
<211> 690
<212> DNA
<213> Streptococcus pneumoniae

<400> 603
atttgtgagg atcttggtga gagaggatcat gaagttactg ttttgacagg aattcctaata 60
tatcctgaag gtaaaacata tgcggattat cggaataaca aaaatagacg agagactata 120

gaaggagtta ctgttttttcg ttcctataca attccaaggg gaaaaagtac tttacatagg 180
 atatttaaatt attttagttt tgctatcagt tctcgatag gggttctact gggacagtat 240
 aaagcaaaag atggatcaga atttgattgt atttttgtaa atcaatcgtc tccagttatg 300
 atggcatggg ctgctatggc ttataaaaat aaatataaga aacctatggt tctgtattgt 360
 atggatgttt ggccagatag tttaaactgta ggtggagtga aacaagatgg cttgattttc 420
 aagttgttta aatttatatc gaaaaaagtt tatcgagcta gtgattatat atttgttact 480
 agtccatcat ttaagaatta ttttgtgaac caatttgaca taacagaaca aaagattact 540
 tatttgccac aatatgcaga agatcttttt atccctgatg aatctagagt taataaagaa 600
 agtggtgacc taacttttgc tggtaatat ggcaaagcac aaaatttgga aactattttg 660
 aaagctgcc a gtttgataga gaagaatacc 690

<210> 604
 <211> 588
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 604
 caacttctga ttatgccttt gtggatcctg ttgggagtag tgtctatttt ttctagaatt 60
 gacatggaac gatcattcct atttttttta ttaacaatag gttgtttaat tagcactatt 120
 gctttgttag atatagttac gggagtatct tatgtcttta atggtttgtc tcagcaactc 180
 tatttggtctg tgggaattct agtttttaggc tactggaatg ctgatgtgat tgttcattat 240
 tggaaaatca tcaccatgac ttttttggga gcatgtttgc tgatttcagt ggatatttat 300
 tttcactact ttcaaggaca tactttttca aatattgatt atgtttatcg agctaagaat 360
 tcagcggcat ctatcttttt atcggcagtt attctcaact tgtctctata taatcgcaag 420
 tgggcactgt ggagaaaagt attgttatta gctagtagcg gattgctgat ttacatgtgc 480
 atccttatgc ggtcacgagc agttctgtta gcagctgcag tacttccgct agtttatata 540
 tggtttcagg agacgtcttt ggggcataag attggacgga cattagga 588

<210> 605
 <211> 739
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 605
 agtggaaacta tgtgtttaat cttgccaata aactattttc tctaactatt ccacttattg 60

ttactcccta tgtcactcga gtcttttctt cagatcattt tgggatttat acttatacca 120
atacagttgc ttcttacttt gttaccttta cattgatggg gataagtatg tatggaagta 180
agaaaatttc tcttaaaaga catgatgaga tagcagtcaa tgatgaatat gcttccttac 240
tgactgtcca gctgcttaat gtaggtctag ccacgttaac ttactttctc tatgtgacct 300
tttttgtcaa taataatcaa gttatttatt ggatccagat gttgtatgtg atttctgctg 360
ttttgatatg acttggtttt tatcaggatt ggaacgtttt cgtgaaattg ctgttcgaaa 420
tatcattgta aatgtcttat cagccctcat gatttttttc tttgtgcata cggaggctga 480
tttggtctatc tataccttaa taaaggtagg gacgattttt atcagtcaga ttgttatttt 540
tttaccagtt gttcggatgc aacggtttta tcttgcagga gctgaacata ttcgacgtac 600
ctatcgaggc ttgcttttgt tgtttatccc tgttttggca gacacccttt ttcaaactat 660
ggataagatc atgctaggta tctatgcac ctatactgct gtgggtttgt attactcaag 720
taggatgggt gctgacac 739

<210> 606
<211> 533
<212> DNA
<213> Streptococcus agalactiae

<400> 606
aaagaaacac tcacatacac ctctacgggt gattaattta tttcttttgg tgatttttat 60
tttgtaagt gtagtctcat tatttcttat gtatcgtcac catttttttg catttagaca 120
cttgaacgtc atttatggag ttgtaattat tttaatcatt ttagcaagtt tatttctttg 180
tattaagaat aaagctagaa tttttacaac tataatttta gtactatcct ctattttcgt 240
tgctactact ttatatggat ttaagtcaac cattgatttg acaaataatc taaataaaac 300
tgcttcatac tctgaaattg agatgagtgt agttgtacca aaagattcta aaataaccaa 360
tatagaagct gtcagcaa atagccgcacc agttaaaaac gatacttcaa atattactga 420
tttgatagaa catataaaat cagaaaaagg aatctctatt acaccacaaa aaacagattc 480
ttaccaggat gcatacaata gaattaaaaa tgggtgatagt caagctatgg ttt 533

<210> 607
<211> 510
<212> DNA
<213> Streptococcus agalactiae

<400> 607